STUDY OF WATER RESOURCE MANAGEMENT

Rocky Flats Plant Site

Task 23
of the
Zero-Offsite Water-Discharge Study

Prepared For:

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BOA Contract BA 72429PB
Contract No. BA 79844GS

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Draft: May 14, 1991
Final: May 28, 1991

ASI PROJECT NUMBER 208.0123

DISCLAIMER

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EXECUTIVE SUMMARY

This report has been prepared for one of several studies being conducted for, and in the development of, a Zero-Offsite Water-Discharge Plan for the Rocky Flats Plant (RFP) in response to Item C.7 of the Agreement in Principle (AIP) between the Colorado Department of Health (CDH) and the U.S. Department of Energy (DOE) (DOE and State of Colorado, 1989). The CDH/DOE Agreement Item C.7 states "Source Reduction and Zero-Discharge Study: Conduct a study of all available methods to eliminate Rocky Flats discharges to the environment including surface waters and ground water. This review should include a source reduction review" (DOE and State of Colorado, 1989, p. 8).

Several aspects of water-resources management are important components of any strategy to eliminate water discharges from the RFP. The objective of this report is to describe an applicable methodology for the investigation and evaluation of water-resources management alternatives at the RFP. Data and information sources relevant to developing an integrated planning system to allow for the matching of water demands with water sources, including wastewater, surface runoff, and ground water at the RFP were the focus of this study.

The general approach to this study consisted of describing the setting, reviewing other water management activities at the RFP, developing a dynamic water management planning method, and making recommendations for the use and maintenance of the management planning method.

Three basic sources contribute water to the RFP site. These are water specifically imported into the plant to provide industrial and domestic needs, precipitation falling on the plant site, and water which enters the plant on the surface or underground from upstream sources.

The following is a general listing of the types of potential sources of contamination from the RFP sources to the surface and ground-water systems of the region:

- Industrial Process Water and Wastewater
- Sanitary Waste Streams
- Surface Water Runoff
- Surface Water Runoff from Disposal Sites and Individual Hazardous Substance Sites (IHSSs)
- Subsurface Leaching from Disposal Sites and IHSSs

The information developed in other tasks of the Zero Off-Site Water Discharge (ZOWD) Study, as well as external efforts, was reviewed so as to develop a structure for current and future use of this information in the overall decision-making process regarding water-resources management. The structure was used to report the information from each task relevant to the overall water-resources management effort, the actual data were extracted from the studies available at this time, and a description of the major interrelationships among the 30 tasks of the Zero-Offsite Water-Discharge Study and other water management studies at RFP.

The work of each of the tasks of the Zero-Offsite Water-Discharge Study was scoped to address a specific issue regarding basic data or required action to achieve the goals of the Zero-Offsite Water-Discharge Study. In spite of an overall agreement on general format between tasks, it is not easy to assimilate and compare the information presented in each of the task-level reports for decision-making purposes. Searching for combinations of alternative courses of action described in the individual reports, keeping track of assumptions and objectives, and estimating the cumulative effect of these individual actions can be facilitated by a structured data reporting process. An attempt was made to balance the need for detailed information by the decision-support system presented in a later section with the availability of data and actions which are cloaked in uncertainty, and which are dependent upon a large set of externalities over which the

water resources planners in the case of the RFP have little or no control. The reader is encouraged to refer to the subordinate task reports themselves for more detail on any area of particular interest.

The various subordinate studies of the Zero-Offsite Water-Discharge Study are often related to each other in the sense that they provide important inputs to each other and the assumptions developed for one task may influence the results of another. For example, implementing the recommendations of one task may preclude further discharge reductions which would be possible if the recommendations of another task were followed independently.

The basic water management information developed in each of the other subordinate tasks to the Zero-Offsite Water-Discharge Study are presented in this report. This information includes the impact, on each water system within the RFP, of the task recommendations, as well as environmental and cost impacts.

The Zero-Offsite Water-Discharge decision support system (DSS) described in this report is a process whereby the goals of the Zero-Offsite Water-Discharge program can be evaluated in terms of the data and actions developed in each of the subordinate tasks as well as the outside influences of other studies and/or decisions.

The approach was to develop a computerized DSS which permits the decision-maker some flexibility in defining goals and which suggests useful combinations of actions to achieve those goals. The concept is iterative and interactive, leading to an optimization of the Zero-Offsite Water-Discharge Plan. Another important feature of the decision support system is that it accepts changes, not just in the goals for the Plan but also in the information base which drives it. The DSS assists the user in the following efforts:

Goal Setting:

A number of possible definitions of the term "zero-offsite water-discharge" have been discussed. These have ranged from extremely strict (an absolute ban on any type of discharge of water beyond the RFP boundaries) to relatively mild (an attempt to prevent as much contamination as technically and economically feasible from leaving the plant boundaries but permitting "clean" water to leave). The system begins by requiring the user to define his initial goals.

Information Base Maintenance:

It is expected that the data which are used by the system to evaluate the feasibility of the defined goals will change often. Changes to the basic data can occur in the areas of monitoring information, new or updated information developed as part of another task, or relevant external information such as actions or data specified in other water management studies. Updating the information base is done in a dBase III+ environment, which results in a file accessible by the ZOWD DSS computer code.

Consultation:

At this point, the system compares the demands of the goals to the constraints and opportunities of the information contained in the data base. The system then suggests one or more courses of action which best achieve the desired goals. An opportunity exists at this point to go back to an earlier stage in the process to change information or goals.

The basic computations carried out by the system are fundamentally simple so as to make the results intuitively acceptable as much as possible. For example, the total changes in water discharge forecast by each task are aggregated by simply adding these together, unless there is specific information in the data base which precludes this approach (the data indicates that the discharge reduction or increase is dependent on actions to be taken in linked tasks.) The system is not a replacement for informed judgment; it is simply an aid.

A sample run of the ZOWD DSS is found in Appendix C. The information base used for this sample consists of the data found in the dBase file reproduced in Appendix E. Initial results are given in Section 4.2, although these should not be considered definitive pending the availability of additional Zero-Offsite Water-Discharge task results. The ZOWD DSS may be a useful tool in the completion of Task 30, Consolidation and Zero-Discharge Plan (ASI, 1990i).

1.0 INTRODUCTION

1.1 BACKGROUND

This report has been prepared for one of several studies being conducted for, and in the development of, a Zero-Offsite Water-Discharge Plan for the Rocky Flats Plant (RFP) in response to Item C.7 of the Agreement in Principle (AIP) between the Colorado Department of Health (CDH) and the U.S. Department of Energy (DOE) (DOE and State of Colorado, 1989). The CDH/DOE Agreement Item C.7 states "Source Reduction and Zero-Discharge Study: Conduct a study of all available methods to eliminate Rocky Flats discharges to the environment including surface waters and ground water. This review should include a source reduction review" , (DOE and State of Colorado, 1989, p. 8).

Several aspects of water-resources management are important components of any strategy to eliminate water discharges from the RFP. The objective of this report is to describe an applicable methodology for the investigation and evaluation of water-resources management alternatives at the RFP. Data and information sources relevant to developing an integrated planning system to allow for the matching of water demands with water sources, including wastewater, surface runoff, and ground water at the RFP were the focus of this study.

The general approach to this study consisted of the following steps:

A. Describe the setting

- Describe the applicable regulatory actions affecting Zero-Offsite Water-Discharge and other related environmental efforts; and
- Identify potential benefits of water-resources management on the Zero-Offsite Water-Discharge Plan.

B. Review other water management activities at the RFP

- Review the Surface Water Management Plan (WWE, 1991);

- Review the preliminary results and relationships of the other Zero-Offsite Water-Discharge tasks, and their impact on water management; and

- Investigate other on-going management efforts which may impact water resources.

C. Develop a dynamic water management planning method

- Present a method for the integration of hydrologic and water-resources-related data bases and information systems, including monitoring data;

- Obtain agreement on a process for setting interim and final goals for the Zero-Offsite Water-Discharge Plan. As part of this effort, identify the stakeholders important to implementing Zero-Offsite Water-Discharge (eg. those with significant input and/or interest in the process.);

- Devise a procedure for combining goals, monitoring data, external inputs, environmental and mission constraints, economic and funding limits, and on-going plan elements to produce a set of prioritized short-term actions and longer-term strategies; and

- Develop an interface between the water management planning method and decision-makers.

D. Make recommendations for use of the water management planning method

- Maintenance needs

- Schedule Framework

The interactions of these steps are shown schematically in Figure 1.

1.2 REGULATORY DRIVING FORCES

In order to understand the need for an integrated water-resources management plan aimed at minimizing offsite water discharge, the first step is to review the regulatory driving forces applicable to RFP water resources. Operations at the RFP have been curtailed since the summer 1989 investigatory actions at the RFP (DOE, 1989) which cited severe health, safety, and

environmental problems at the facility. Several intergovernmental agreements were developed in response to this situation to ensure compliance with State and federal health, safety, and environmental laws and regulations prior to full resumption of operations at the RFP. In addition, there are a number of laws and regulations which affect the management of waters at the RFP, as shown in Tables 1 and 2.

The future mission of the RFP remains in doubt. There are at least three Environmental Impact Statements (EISs) and numerous Environmental Assessments (EAs) which are in process or about to begin which will affect the future of the plant (EG&G, 1991). Any of the EISs or EAs may result in the implementation of mitigation plans which may influence water management at the RFP. These EAs and EISs include:

- Programmatic EIS on the future of the U.S. Weapons Complex (EG&G, 1991). This programmatic EIS is nation-wide in scope and will have a direct influence on the future of the RFP. Included in the scope of this EIS are such issues as alternative locations for plutonium fabrication other than RFP.

- Programmatic EIS on the Environmental Restoration (ER) programs throughout the U.S. nuclear weapons facilities (EG&G, 1991). This EIS will influence ongoing ER programs at RFP and may constrain the range of actions available to water managers at RFP. Comprehensive Environmental Response, Compensation and Liability (CERCLA or Superfund) Act actions may take precedence over EIS recommendations.

- Sitewide EIS (SWEIS) for the RFP (EG&G, 1991). This EIS will replace and supplement the 1980 Final EIS for the RFP (DOE, 1980). It is expected that the SWEIS will deal with the environmental issues associated with RFP over the relatively short term, that is, the next five to ten years. Issues appropriate for this

Table 1

Regulations and Agreements Affecting Water Management at RFP.

Regulations
Atomic Energy Act [42 USC 2011 et seq.] and Department of Energy Organization Act [42 USC 7101 et seq.] • Department of Energy Orders (5400.1, 5400.5) • Executive Order 12088
Clean Water Act [33 USC 1251 et seq., as amended] • Environmental Protection Agency Regulations [40 CFR 121-133]
Colorado Water Quality Control Act [Colo. Revised Statutes, Title 25 - Health, Article 8] • Colorado Department of Health Regulations [Code of Colorado Regulations, Title 5, Dept. of Health, Chapter 1002 - Water Quality Control Commission, Articles 3-7]
Agreements
Agreement in Principle (AIP) • Between DOE and Colorado Department of Health. Provides for sampling of surface waters and treated drinking water. Provides for a Zero-discharge study (**this Zero-Offsite Water-Discharge Study**).
Federal Facilities Compliance Agreement (FFCA) • Between DOE and US EPA, under Executive Order 12088. Provides for compliance with water pollution control standards and appropriate operation of the Sewage Treatment Plant.
Interagency Agreement (IAG) • Between DOE, the State of Colorado, and US EPA. Provides guidance for control and cleanup of hazardous wastes under RCRA and CERCLA.

Table 2

Other Laws Affecting Water Management at RFP

Other Applicable Laws
National Environmental Policy Act (NEPA) [42 USC §§ 4321 to 4347 (1977 & West Supp. 1989)]
Resource Conservation and Recovery Act (RCRA) [42 USC § 6901 et seq., as amended]
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) [42 USC § 9601 et seq., as amended]
Clean Air Act (CAA) [42 USC § 7401 et seq., as amended]
Colorado Radiation Control Act [Colorado Revised Statute, Section 25-11-101 et seq.]
Colorado Water Rights Laws [Colorado Revised Statute, Sections 37-92-305(5), and 37-80-120(3) (1973)]

EIS will include cumulative impact of the many activities at the RFP, including those associated with the CDH/DOE Agreement in Principle which is the primary driving force for this study.

- Other, site-specific or building-specific EAs and EISs have been and will continue to be developed as required to comply with the National Environmental Policy Act and DOE directives. These include EAs being developed for environmental restoration sites, such as the 881 Hillside Interim Remedial Actions (DOE, 1990a)

EG&G recently published a "Corrective Action Plan" (DOE, 1990b) to synthesize the DOE/EG&G response to the 1989 Tiger Team report (DOE, 1989). The Tiger Team assessment was an independent review of the RFP operations and their compliance with applicable federal, State, and local regulations, permit requirements, agreements, orders and consent decrees, and DOE orders. In addition to evaluating compliance, the Tiger Team examined RFP operations for conformance with relevant "best" and "accepted" industrial practices to test the adequacy of the RFP's management programs.

The Corrective Action Plan (DOE, 1990b) reviews the 52 audit findings and 43 best management practices contained in the Tiger Team Report. A formal planning process for waste and environmental programs was established through the preparation of five-year planning documents which are to be updated annually. Additional funds as necessary have been requested to support programs identified within the five-year plan. It is expected that the results of this zero-offsite water-discharge water resource management plan will be input into the five-year planning process.

2.0 BRIEF REVIEW OF THE CURRENT WATER RESOURCE MANAGEMENT SYSTEMS AT THE RFP

This section is intended to briefly acquaint the reader with the water-resources management setting at RFP and as such presents only an overview of the water resources affecting the RFP. For a more detailed treatment of the subject, the reader is directed to the recently completed, Draft Surface Water Management Plan (WWE, 1991), and to the Groundwater Protection and Monitoring Program Plan (EG&G, 1990). Other zero-offsite water-discharge plan subordinate studies and their respective Project Management Plans also provide more detailed information, including the following:

- Task 4 Water Yield and Water-Quality Study of Walnut and Woman Creek Watersheds (ASI, 1990d)
- Task 5 Confirmation of Rainfall/Runoff Relationships (ASI, 1991l)
- Task 6 Storm Runoff Quantity for Various Design Events (ASI, 1991a)
- Task 9 Design Recurrence Intervals Study (ASI, 1990f)
- Task 14 Surface-Water and Ground-Water Rights Study in the Vicinity of Rocky Flats Plant (ASI, 1991i)
- Task 16 Water Yield and Water Quality Study of Other Sources Tributary to Standley Lake and Great Western Reservoir (ASI, 1990g)
- Task 17 Alternatives to Zero Discharge (ASI, 1991e)
- Task 21 Temporary Water Storage Capabilities Study (ASI, 1991g)
- Task 22 Ground Water Recharge Study (not completed as of this printing)
- Task 24 Bypass Upstream Flows Around Rocky Flats Plant Study (ASI, 1990h)
- Task 25 Study of Downstream Erosion Potential (ASI, 1991m)
- Task 26 Feasibility of Ground-Water Cutoff/Diversion Study (ASI, 1991j)
- Task 29 Non-Tributary Ground-Water Study (ASI, 1991k)

The following sections present a review of the sources of water entering the RFP, and the origins of contamination from the RFP to the surface and groundwater systems.

2.1 SOURCES OF WATER ENTERING THE RFP

Three basic sources contribute water to the RFP site area, which is defined here as the area bounded within and including the buffer zone. These are water specifically imported into the plant to provide industrial and domestic needs, precipitation falling on the plant site, and water which enters the plant on the surface or underground from upstream sources. A schematic of the current water balance at the RFP is shown as Figure 2 (ASI, 1991c).

2.1.1 Water Imported for Plant Usage

The RFP includes a water treatment plant which is supplied with raw water by the Denver Water Board in accordance with a contract dated October 28, 1952 (WWE, 1991). Under this contract, RFP is entitled to a supply of up to 1.5 million gallons per day, although this amount is not guaranteed and the actual amounts supplied vary over the period. From 1980 to 1989, amounts purchased varied from a low of 92 million gallons per year (MGY) in 1981 to 133.7 MGY in 1986. In recent years the amount has averaged close to 130 MGY or 0.36 million gallons per day (ASI, 1991c). The contract is renewed each year. The water treatment plant provides domestic, fire fighting, and industrial water to the plant.

2.1.2 Precipitation

The RFP receives an average of approximately 15.2 inches of precipitation annually (ASI, 1991g). The bulk of this precipitation tends to occur in sporadic, intense storms rather than in a evenly-distributed manner, and eighty percent of the precipitation occurs between April and September (WWE, 1991). The maximum recorded 24-hour rainfall at the plant was 3.40 inches,

during May, 1969 (WWE, 1991). The estimate of runoff resulting from this precipitation has been addressed in several of the other Zero-Offsite Water-Discharge studies and is subject to some uncertainty, as is to be expected in this climatic and topographic setting (ASI, 1990f, 1990g, 1991a, 1991g). Average annual runoff from the Controlled Area (and surroundings totaling 1.9 square miles) was about 125 acre-feet/year (ASI, 1991i).

2.1.3 Upstream Drainage Areas

Upstream runoff and upgradient groundwater entering the RFP area and underlying subsurface aquifers are not plentiful due to the relatively small size of the upstream drainage areas and the location of the RFP atop a low mesa (see ASI, 1990j for more information on geologic and topographic features of the RFP area). Major flooding of the plant site is unlikely due to the topography of the site which includes excellent drainage with natural streams to the north and south significantly lower in elevation than the RFP buildings. Insufficient information exists to estimate the amount of water which enters the plant site boundaries as run-on each year (ASI, 1991g). A number of alternatives were investigated in another Zero-Offsite Water-Discharge study (ASI, 1991h) for providing upstream surface water runoff diversion and bypasses of the RFP site

The primary affected ground water lies in the Rocky Flats Alluvium, as well as the Arapahoe Formation which has its main recharge area to the west of the RFP site. Together these form the "uppermost aquifer", which is an unconfined system (EG&G, 1990). Some recharge also occurs along stream beds to the north and south of the plant. A deeper aquifer, the Laramie and Fox Hills, is not hydraulically connected to the Arapahoe Formation, and its recharge area is in the west buffer zone of the RFP. The surface and ground water systems at RFP are interactive. Surface water in streams, ditches, and ponds recharges the alluvium, and ground water is discharged to the surface from the Rocky Flats Alluvium at various sites (EG&G, 1990). No

information is available yet on the amounts involved in this interaction, although the ground water monitoring program is designed to help quantify this (EG&G, 1990).

2.2 SOURCES OF POTENTIAL WATER-RELATED CONTAMINATION FROM THE RFP

This section describes qualitatively the major documented sources of contamination from RFP sources to the surface and ground-water systems of the region. Each of the areas discussed below have been the subject of years of research and engineering effort by many investigators. The purpose of this brief review is not to attempt to review or replicate these prior studies here, but simply to identify potential sources of water-borne contamination at or near RFP. The reduction of water discharges from these sources is used as an indicator of the effect of various combinations of individual task recommendations on the goals of the Zero-Offsite Water-Discharge Study, as explained in Chapters 3 and 4.

2.2.1 Industrial Process Water and Wastewater

The industrial process water distribution system may contribute ground water to the Rocky Flats Alluvium which can become contaminated in the soil and provide a conduit for contaminant transport from the RFP. Leakage from the process wastewater collection and treatment loop is a potential source of contamination in those locations where the process wastewater collection system is underground. Another source is potential improper connections of process wastewater to sanitary wastewater treatment system. Industrial wastewater is treated and recycled and/or evaporated presently, so treated industrial effluent does not constitute an apparent source of contamination other than as described above.

2.2.2 Sanitary Waste Streams

Treated sanitary effluent currently averages about 74 million gallons per year (ASI, 1991c) which is released from the sewage treatment plant (STP). Sources of contamination other than the STP effluent include infiltration/inflow and exfiltration (I/I&E) from the sanitary sewer collection system. Recycling STP treated effluent is the subject of Tasks 11 and 13 (ASI, 1991c), and the phenomenon of I/I&E is discussed in Task 1 (ASI, 1990b). Although some I/I&E does occur, the results of Task 1 indicated that at the time of the study it was not cost-effective to correct this problem, in accordance with EPA guidance on the issue.

2.2.3 Surface Water Runoff

Runoff caused by precipitation which falls on the surface area of the RFP can be contaminated due to the previous deposition of airborne contamination from the RFP. Runoff quality measurements performed as part of other Zero-Offsite Water-Discharge tasks indicate that several quality parameters (including radionuclides) exhibit values which exceed stream standards. Stream standards for the Big Dry Creek drainage downstream of the RFP set by the Colorado Department of Health (CDH) (WWE, 1991) are extremely stringent. For example, stream standards for Woman Creek and its tributaries upstream from Standley Lake and for Walnut Creek and its tributaries upstream from Great Western Reservoir classify those waters as Domestic Water Supply, with numeric standards following drinking-water standards except for radionuclides and some trace metals, which are much more stringent (ASI, 1990c). As a result, any runoff from the RFP may be considered a potential contaminant source.

2.2.4 Surface Water Runoff from Disposal Sites and Individual Hazardous Substance Sites (IHSS)s

Surface runoff from contaminated areas in the RFP area, including officially designated IHSSs, may be a source of surface-water and, potentially, ground-water contamination.

2.2.5 Subsurface Leaching from Disposal Sites and IHSSs

Leaching from the present landfill area into the Landfill Pond is estimated to be about 1.7 million gallons per year (ASI, 1990e). This leachate has been found to contain certain radioactive and other contaminants which have exceeded the RFP proposed standards on a routine basis (ASI, 1990e). Ground water leaching from IHSSs such as 881 Hillside is also a potential source of contamination (for more detail see DOE, 1990a).

3.0 REVIEW OF INTERRELATIONSHIPS OF OTHER ZERO-OFFSITE WATER-DISCHARGE STUDIES WITH THE WATER RESOURCES MANAGEMENT PROGRAM

The next step of the approach to this study is to review and integrate the information developed in other tasks of the Zero-Offsite Water-Discharge Study, as well as other efforts, so as to develop a structure for current and future use of this information in the overall decision-making process regarding water-resources management. This section describes the structure used to report the information from each task relevant to the overall water-resources management effort, the actual data extracted from the studies available at this time, and a description of the major interrelationships among the 30 tasks of the Zero-Offsite Water-Discharge Study and other water management studies at RFP.

3.1 INFORMATION REPORTING STRUCTURE

The work of each of the tasks of the Zero-Offsite Water-Discharge Study was scoped to address a specific issue regarding basic data or required action to achieve the goals of the Study (ASI, 1990a). In spite of an overall agreement on general format between tasks, it is not easy to assimilate and compare the information presented in each of the task-level reports for decision-making purposes. Searching for combinations of alternative courses of action described in the individual reports, keeping track of assumptions and objectives, and estimating the cumulative effect of these individual actions can be facilitated by the development of a structured data reporting process such as is presented in this section. No claim is made that this structure is all-inclusive or fool-proof. An attempt was made to balance the need for detailed information by the decision-support system presented in a later section with the reality of the data and actions which are fraught with uncertainty, and which are dependent upon a large set of externalities over which the water resources planners in the case of the RFP have little or no control. The reader

is encouraged to refer to the subordinate task reports themselves for more detail on any area of particular interest.

Eight key items were judged to adequately depict the character and results of each subordinate task, as described below. In addition, it was necessary to analyze consequences of the task recommendations over time, that is, immediate actions (FY91/92), short-term actions (over the next five years or so), and longer term actions. Following is a description of the reporting dimensions found in the series of tables presented in Section 3.3.

Item 1. **Data vs. Action.**

Subordinate tasks were classified as "Data" if they were performed primarily to develop necessary data and information for the Zero-Offsite Water-Discharge Study, but they do not recommend any particular action. "Action" was specified if a task was primarily intended to result in a tangible improvement in the zero-discharge goals through some recommendation for action. Goals and objectives are defined by the user of the Zero-Offsite Water-Discharge model (described in Chapter 4) which uses the information reported in the tables found in Section 3.3. Note that the classification may change in time (immediate, short-term, long-term).

Item 2. **Technical vs. Political/Regulatory.**

"Technical" was used if the information developed in the task was totally driven by some scientific rationale for the collection of data or development of information. "Political/Regulatory" was entered when the driving force for the task resulted from an evaluation of a political or regulatory action, and/or when results were dictated by such actions.

Item 3. **System Impact.**

These entries describe the expected impact of the task's recommendation(s) on the aspects of the water system specified. The "Delta MGY" entry is the expected change from the base in million gallons per year. The "base case" is normally defined in each task. "Conf fact (%)" is a subjective confidence factor ranging from 0 to 100 percent which is attached to the impact estimate. The confidence factor is used by the system to compute a cumulative confidence level for the efficacy of a particular plan made up of several individual task action recommendations. As can be seen in Appendix F, the total change in water conveyed off-site from the RFP is further broken down into point-source discharges, surface water runoff, ground water, and so on.

Item 4. **Financial Impact**

Any comprehensive water management plan will need to be subjected to economic or financial analysis to assess its feasibility. The total expected cost of the task recommendation(s), including present worth of capital and OM&R costs, where estimated, were entered from the information given in the task reports. If the task did not recommend a direct structural improvement but recommendations could impact costs of related plan improvements (such as recommendations of other tasks), a cross-reference to impacted structural features and cost implications were indicated where possible.

Item 5. **Environmental Impact**

At this time, it is not possible to perform a full environmental analysis of the actions recommended in each of the tasks. This is more appropriately done in a formal environmental document such as the upcoming Site-Wide Environmental Impact Statement. It is important, however, to indicate in qualitative terms the overall environmental impact of the task's recommended action(s). A simple

ranking scheme between 0 to 10 was used, where 0 indicates no discernible impact whereas a value of 10 indicates severe environmental impact. This factor may also be used as a "screening tool" to identify areas which may be impacted and the required EIS documentation that may result.

Item 6. **Input from Other Tasks**

This indicator was used to enumerate those other subordinate tasks which provide important input to this task, or which are impacted by the results of the present task.

Item 7. **Input from Water Resource Plans**

This refers to the recent draft Surface Water Management Plan (WWE, 1991) and the Groundwater Protection and Monitoring Program Plan (EG&G, 1990). Where possible, direct references to other reports were made.

Item 8. **Input from Monitoring**

A code was used to identify a "Monitoring Group" with responsibility for monitoring data or actions which would affect the task. Codes for these monitoring groups are shown in Table 3.

Table 3

Monitoring Groups

Group Code	Description
DOE	U.S. Department of Energy
EMAD	Environmental Monitoring and Assessment Division, EG&G
CWAD	Clean Water Act Division, EG&G
ASI	Advanced Sciences, Inc.
CDH	Colorado Department of Health
USGS	U.S. Geological Survey
EPA	U.S. Environmental Protection Agency
FE	Facilities Engineering, EG&G
SCS	U.S. Soil Conservation Service
Broom	City of Broomfield

Table 4

ZOWDS Related Task Groups

Task	Description
GROUP I -- WASTEWATER RECYCLE	
11/13	Treated Sewage/Process Wastewater Recycle Study
10	Sewage Treatment Plant Evaluation Study
19	Study of Process Waste Minimization
20	Raw, Domestic and Process Water Pipeline Leak Study
12	Reverse Osmosis and Mechanical Evaporation Study
18	Drain Study
1	Sanitary Sewer Infiltration/Inflow and Exfiltration Study
GROUP II -- STORM WATER	
9	Design Recurrence Intervals Study
4	Water-Yield and Water-Quality Study of Walnut Creek and Woman Creek Watersheds
16	Water-Yield and Water-Quality Study of Other Sources Tributary to Standley Lake and Great Western Reservoir
6	Storm Runoff Quantity for Design Events Study
24	Bypass Upstream Flows Around Rocky Flats Plant Study
21	Temporary Water Storage Capabilities Study
15	Surface Water Evaporation Study
25	Study of Downstream Erosion Potential
5	Confirmation of Rainfall/Runoff Relationships Study
2/3	Storm Sewer I/I/E Study and Non-point Source Assessment

Table 4 (continued)

ZOWDS Related Task Groups

Task	Description
GROUP III -- GROUND WATER	
7	Solar Pond Interceptor Trench System Ground-Water Management Study
8	Present Landfill Area Ground-Water/Surface Water Collection Study
22	Ground-Water Recharge Study
26	Feasibility of Ground-Water Cutoff and Diversion Study
29	Non-Tributary Ground-Water Study
GROUP IV -- WATER MANAGEMENT	
23	Study of Water Resource Management
27	Waste Generation Treatment Study
28	Augmentation Plan for Rocky Flats Plant
14	Surface-Water and Ground-Water Rights Study
17	Alternatives to Zero Discharge Study
30	Consolidation and Zero Discharge Plan

4.0 INTEGRATION OF DATABASES AND INFORMATION SYSTEMS

4.1 APPROACH

The Zero-Offsite Water-Discharge decision support system is a process whereby the goals of the program can be evaluated in terms of the data and actions developed in each of the 30 subordinate tasks, as well as the outside influences of other studies and/or decisions. The key point is to be able to formulate specific goals for a Zero-Offsite Water-Discharge Program.

The approach was to develop a computerized decision support system which permits the decision-maker some flexibility in defining goals and which suggests useful combinations of actions to achieve those goals. The model works with the information presented in Appendix F only. The decision maker may have access to additional relevant information which he must apply to the model results. For example, the decision maker may be aware of funding constraints or political pressures which would affect any plan but which are not explicitly described in the model. There may be important interactions (such as precedence of actions) between the individual Zero-Offsite Water-Discharge tasks or between Zero-Offsite Water-Discharge tasks and external activities which are not represented in the model. The model presents the decision maker with suggestions on optimal courses of action within a limited information environment. To this the decision maker must add his understanding of the Zero-Offsite Water-Discharge program and of other activities at RFP.

The concept is iterative and interactive, leading to a quasi-optimization of the Zero-Offsite Water-Discharge Plan. An important feature of the decision support system is that it accepts changes, not just in the goals for the Plan but also in the information base which drives it. A schematic of the approach is shown in Figure 4, and is described as follows:

Goal Setting:

A number of possible definitions of the term "zero-offsite water-discharge" have been discussed (WWE, 1991; ASI, 1990a). These have ranged from extremely strict (an absolute ban on any type of discharge of water beyond the RFP boundaries) to relatively mild (an attempt to prevent as much contamination as technically and economically feasible from leaving the plant boundaries but permitting "clean" water to leave). The system begins by requiring the user to define his initial goals.

Information Base Maintenance:

It is expected that the data which are used by the system to evaluate the feasibility of the defined goals will change often. At this point, the system inquires if changes to the basic data have occurred in the areas of monitoring information, new or updated information developed as part of another task, or relevant external information such as actions or data specified in other water management studies. Updating the information base is not done by the system; but rather, the system directs the user as to the necessary procedures. For example, the information presented in Section 3.3 and Appendix F has been stored in a dBase III+ file for access by the decision-support system (see Appendix E), and modifications or additions to that file are accomplished using the dBase III+ program. Information changes to the dBase file can be updated data or even structural changes to the task descriptions themselves. For example, a new field may need to be added to the system to incorporate new information not previously catalogued. Appendix D includes instructions for updating the dBase file.

Consultation:

At this point, the system compares the demands of the goals to the constraints and opportunities of the information contained in the data base. The system then suggests one or more courses of action which best achieve the desired goals. An opportunity exists at this point to go back to an earlier stage in the process to change information or goals.

The basic computations carried out by the system are fundamentally simple so as to make the results intuitively acceptable as much as possible. The process begins with Program COMB, which searches for all possible combinations of task alternatives and provides a pointer file for use in the main analytical program, called Zero-Offsite Water-Discharge (ZOWD). ZOWD assists the decision maker in stating his goals and objectives and then checks each combination of tasks to see which combination best meets those goals. ZOWD tallies the total changes in water discharge forecast by each task by simply adding these together, subject to the constraints of relationships to other tasks to prevent double counting of discharge reductions.

The system is not a replacement for informed judgment; it is simply an aid. The FORTRAN code listings for programs COMB and ZOWD are found in Appendices A and B. Appendix D contains information needed to operate these two programs.

4.2 PRELIMINARY RESULTS

A sample run of the ZOWD, Decision Support System computer program is found in Appendix C. The information base used for this sample consists only of the data found in the dBase file reproduced in Appendix E. This information corresponds to the data presented in Appendix F of this report. The ZOWD model was exercised several times with different goal sets. The results are presented in Table 5.

Given the information available as of this date and the goals stated in Table 5, it appears that the best course for the Zero-Offsite Water-Discharge Plan is a combination of the recommendations of Tasks 11/13, Treated Sewage/Process Wastewater Recycle Study (ASI, 1991c) increased capacity alternative, with the recommendations of Task 21, Temporary Water Storage Capabilities Study (ASI, 1991g) terminal ponds alternative. It must be emphasized that the decision makers

Table 5

Initial ZOWD Model Results

Goal	ZOWD Recommended Task Actions and Results
"Absolute" Zero Discharge (Low Cost is Secondary Objective)	****** Goal Selected is: 1 Absolute Zero-Discharge** **<<<<<The best combination of Tasks for this goal follows>>>>>** **Actions which SUPPORT the objectives of this goal are:** **11 0 Process Water Reuse Potential Study** **21 1 Temporary Water Storage - Great Western** **I. Wastewater Recycle** **Total change in Offsite Water Discharge: -74.0 MGY** **Minimum change with confidence factor: -59.2 MGY** **Approximate Total Cost ($ millions): 1.67** **Average environmental impact code (0-10) 2.00** **II. Storm Water** **Total change in Offsite Water Discharge: -52.3 MGY** **Minimum change with confidence factor: -26.2 MGY** **Approximate Total Cost ($ millions): 91.10** **Average environmental impact code (0-10) 9.00** **Total All Groups** **Total change in Offsite Water Discharge: -126.3 MGY** **Minimum change with confidence factor: -85.4 MGY** **Approximate Total Cost ($ millions): 92.77** **Average environmental impact code (0-10) 5.50** **Actions which OPPOSE the objectives of this goal are:** **8 0 Present Landfill Area GW/Surf. Water Collection** **III. Ground Water** **Total change in Offsite Water Discharge: 3.7 MGY** **Minimum change with confidence factor: 3.0 MGY** **Approximate Total Cost ($ millions): .00** **Average environmental impact code (0-10) .00** **Total All Groups** **Total change in Offsite Water Discharge: 3.7 MGY** **Minimum change with confidence factor: 3.0 MGY** **Approximate Total Cost ($ millions): .00** **Average environmental impact code (0-10) .00**

Table 5 (continued)

Initial ZOWD Model Results

Goal	ZOWD Recommended Task Actions and Results
Zero Waste Discharge (Low cost is secondary objective)	Actions which SUPPORT the objectives of this goal are: 11 1 Task 11/13 Selected Alternate, Increase Capac. 21 2 Temporary Water Storage - Terminal Ponds I. Wastewater Recycle Total change in Offsite Water Discharge: -76.2 MGY Minimum change with confidence factor: -61.0 MGY Approximate Total Cost ($ millions): 1.67 Average environmental impact code (0-10) 2.00 II. Storm Water Total change in Offsite Water Discharge: -80.7 MGY Minimum change with confidence factor: -40.3 MGY Approximate Total Cost ($ millions): 16.30 Average environmental impact code (0-10) 8.00 Total All Groups Total change in Offsite Water Discharge: -156.9 MGY Minimum change with confidence factor: -101.3 MGY Approximate Total Cost ($ millions): 17.97 Average environmental impact code (0-10) 5.00 *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

with responsibilities for the Zero-Offsite Water-Discharge Plan must use their judgement in the acceptance of these results. Different goal sets may result in different recommendations.

5.0 RECOMMENDED WATER-RELATED MONITORING AND REPORTING SYSTEM

This report has as its primary goal the development of a decision support system which can be used by decision makers at RFP to assist in the development of a Zero Offsite Water-Discharge Plan. The control of water discharges from the RFP involves a coordinated effort on the part of many responsible groups within RFP. Specific actions to achieve this goal will be recommended in Task 30, Consolidation and Zero-Discharge Plan (ASI, 1990i).

The ZOWD DSS can only be as good as the data it uses. The following points constitute the recommended monitoring program to be used to maintain the validity and usefulness of the ZOWD DSS:

- ***Purpose and Scope.*** The ZOWD decision support system (DSS) is designed to provide decision makers at RFP with suggested courses of action given the prior development of candidate alternative recommendations of the various tasks of the Zero Offsite Water-Discharge Study. It is a planning tool rather than a real-time operations tool. The data base contains "bottom line" information only on the projected effect of each task on annual discharge reductions.

- ***Data Required.*** The monitoring program to maintain the ZOWD DSS data base must report discharge changes in MGY per year. This means that raw water quality and quantity data gathered by various monitoring groups must be analyzed for its "bottom line" effect on water-discharge reductions prior to entering them into the ZOWD data base. Discharge reductions (or increases) should be reported for the following systems: all water systems as a group; wastewater; point-source discharges; sources affecting the ground water; surface runoff; and, domestic waste. The ZOWD DSS assumes that information will be available for

three time horizons: the present (defined as Fiscal Years 1991 and 1992), the near future (the next five years or so), and the longer term future. Present worth of capital and OM&R costs to carry out task recommendations should be reported and updated as necessary. The overall environmental impact of any recommendation should be estimated and reported as an indicator code. As stated earlier, Appendix F of this report can be used as data capture forms to facilitate data entry into the dBase III+ file.

- ***Responsible Parties.*** Because of the specialized nature of the ZOWD DSS and its data bases, it is important that there be a single point of responsibility and authority for reporting monitoring data which is likely to affect the Zero Offsite Water-Discharge Plan. The EG&G group currently responsible for the Zero Offsite Water-Discharge Plan (Plant Engineering, Civil/Environmental Restoration) should be the responsible party for data base maintenance.

- ***Schedule for Data Base Maintenance.*** The information contained in the ZOWD data base should be reviewed annually to make sure that it is still relevant and accurate in view of potentially changing conditions at RFP. In particular, the assumptions which were used by each of the task authors regarding important parameters (RFP population, hydrology, hydraulics, stream standards, etc.) should be reviewed. If these depart significantly from those used during the Zero Offsite Water-Discharge Study, consideration should be given to revising the affected tasks.

6.0 ACKNOWLEDGEMENTS

This report was prepared under the direction of Michael G. Waltermire, P.E., Project Manager, of Advanced Sciences, Inc. Balloffet and Associates, Inc. (B&A) provided major support to ASI for this Task. This draft was prepared by Armando F. Balloffet, P.E. of B&A and was reviewed by Larry Quinn, P.E. of B&A and Dr. Timothy D. Steele, and Dr. James R. Kunkel and Tyler D. Smart, PE of ASI. EG&G and DOE responsive reviewers of this report included:

R.A. Applehans - EG&G (PE/C-ER)

This interim report was prepared and submitted in partial fulfillment of the Zero-Offsite Water-Discharge Study being conducted by ASI on behalf of EG&G Rocky Flats, Inc. EG&G's Project Engineer was R.A. Applehans of EG&G's Plant Engineering, Civil/Environmental Restoration (PE/C-ER).

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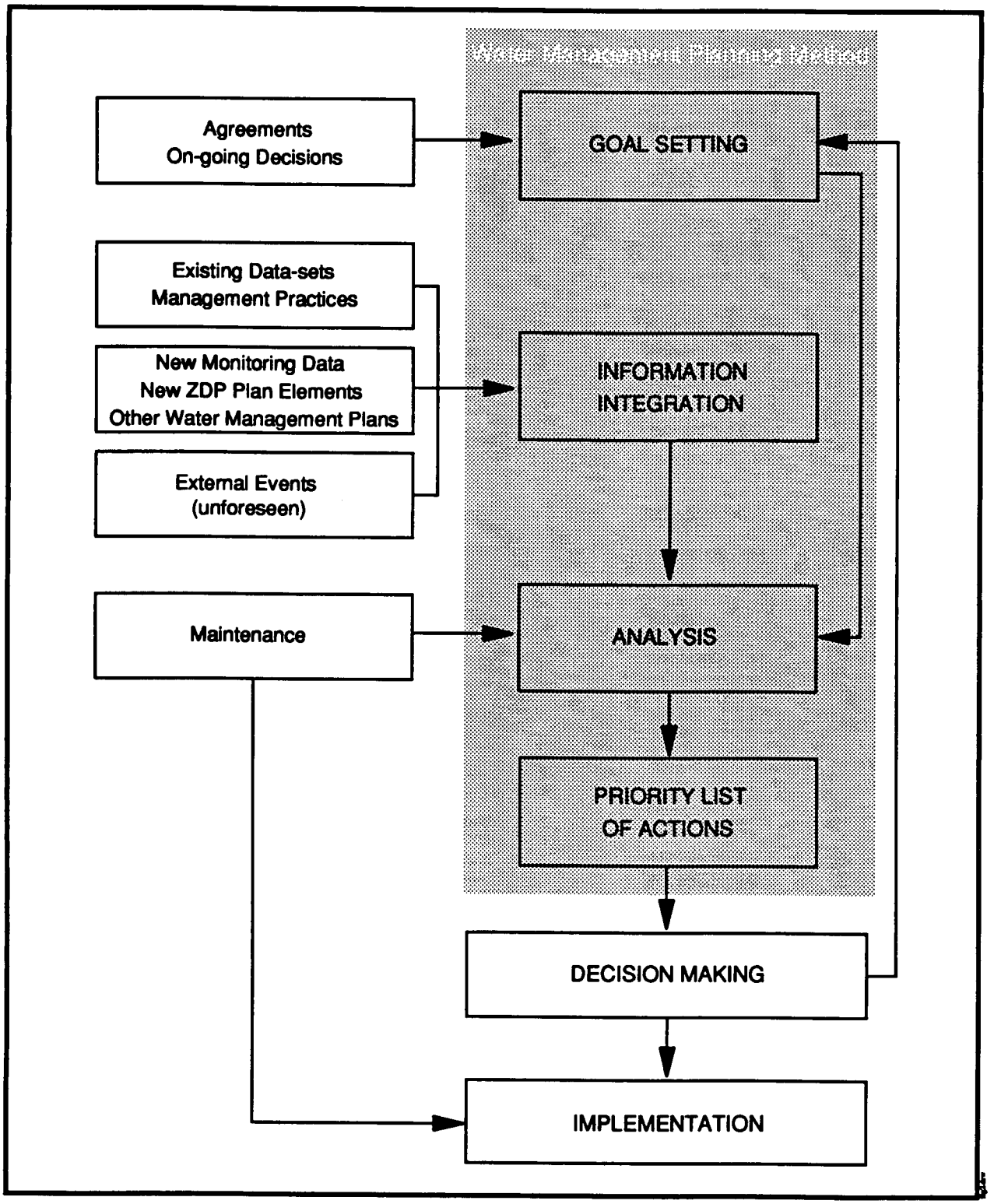
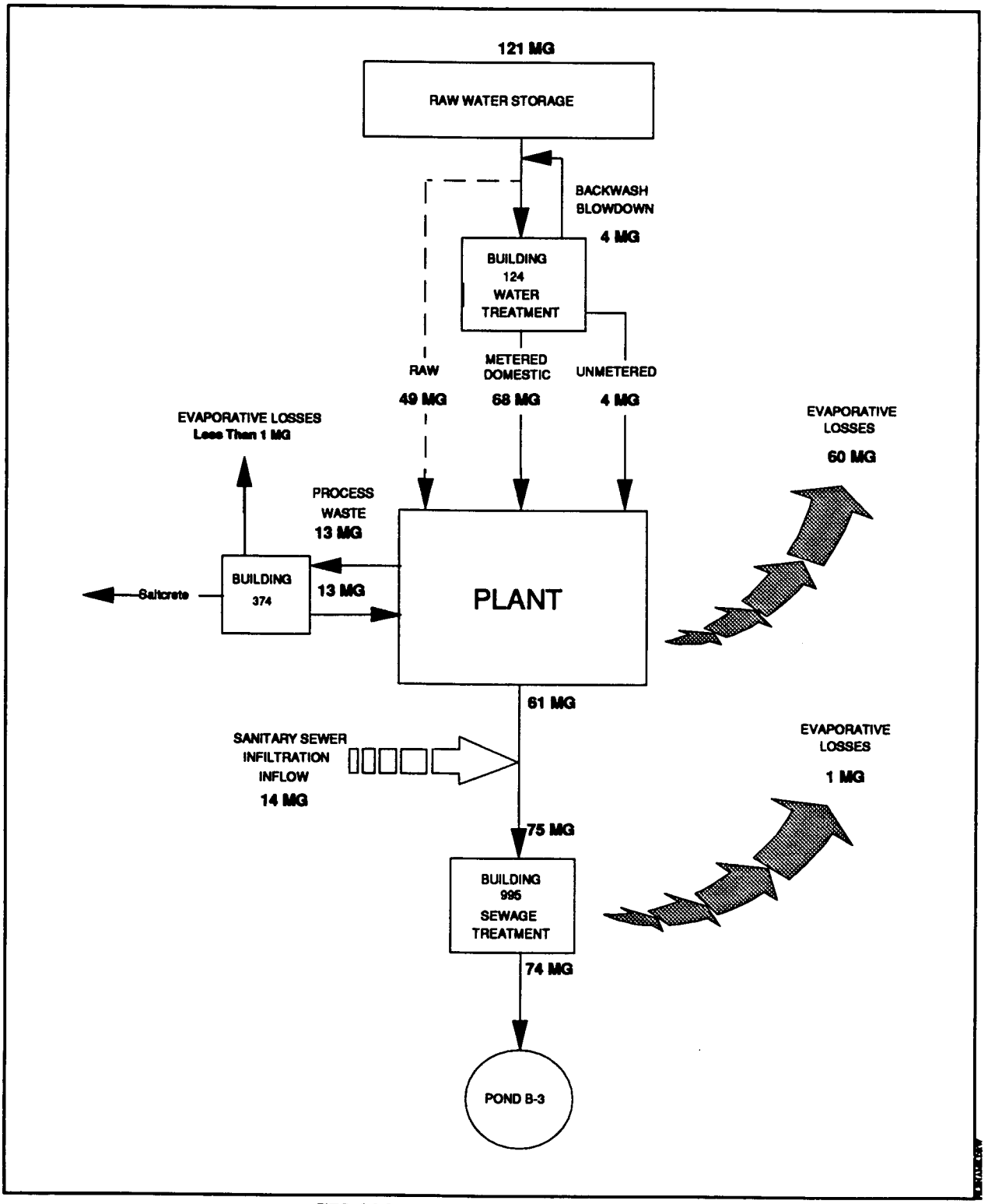
FIGURES



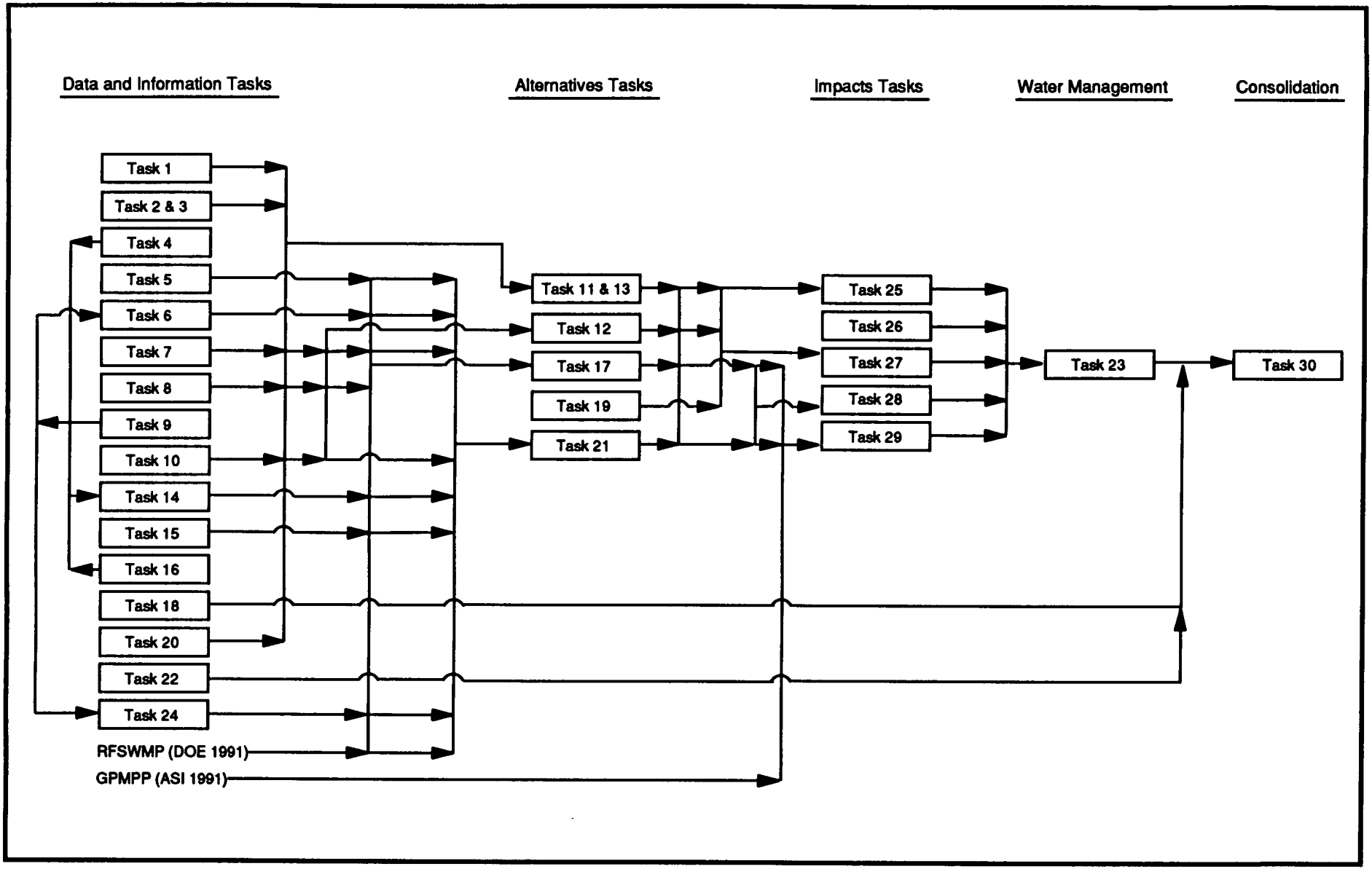
GENERAL APPROACH



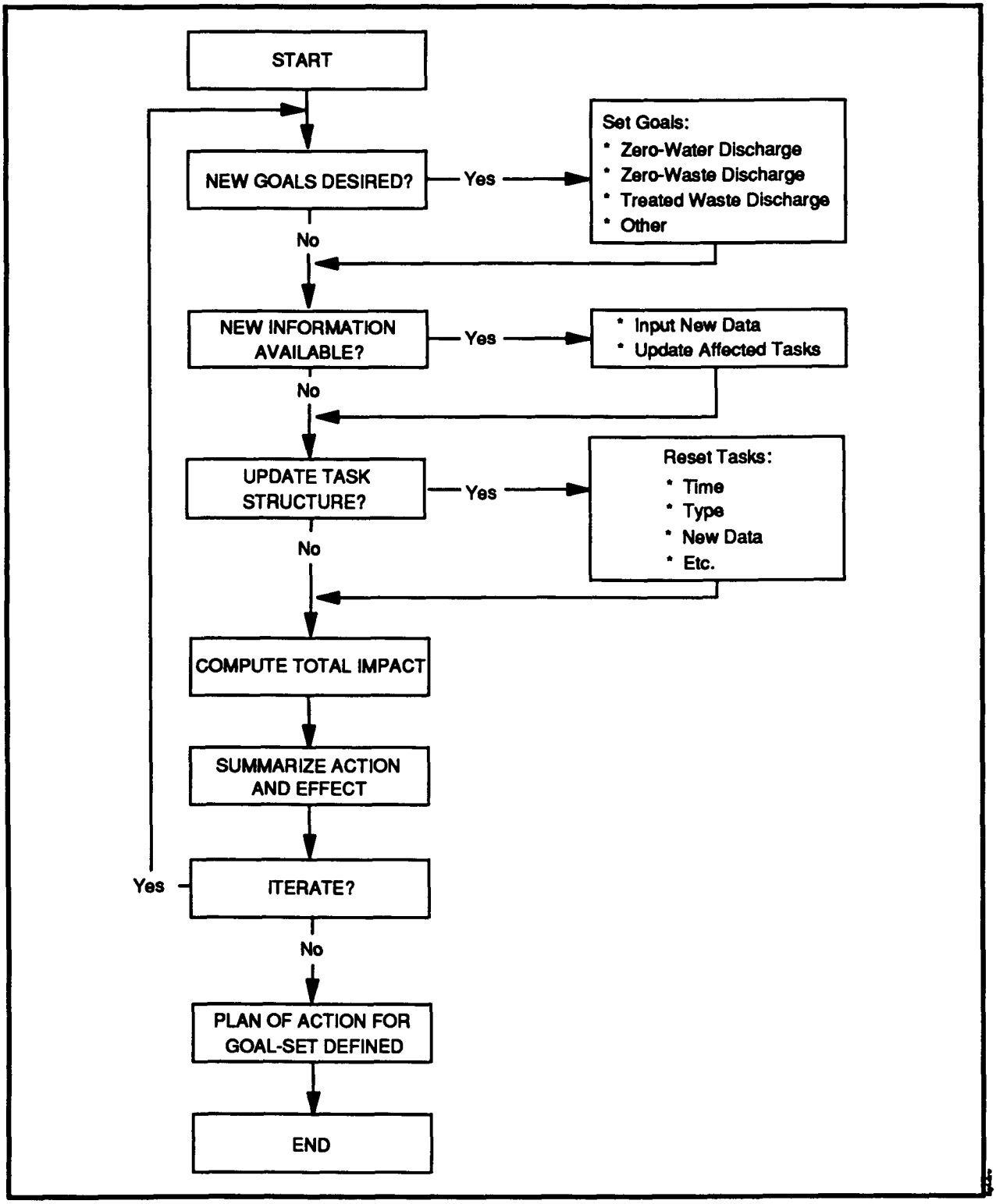
CY 1989 WATER BALANCE
ROCKY FLATS PLANT

Water Resource Management Study
Zero-Offsite Water Discharge

PROJECT 208.01.23
FIGURE 2



TASK INTERRELATIONSHIPS DIAGRAM



DECISION SUPPORT SYSTEM APPROACH

FIGURES

A

APPENDIX A

COMB Program Code

```
C
C         PROGRAM - COMB
C       CREATES FILE OF TASK/ALTERNATIVE COMBINATIONS
C         TO BE USED BY PROGRAM ZOWD
C         ZERO-OFFSITE WATER-DISCHARGE PLAN AT ROCKY FLATS.
C         PROGRAMMER: A.F.BALLOFFET, BALLOFFET AND ASSOCIATES, INC.
C         UNDER CONTRACT TO ADVANCED SCIENCES, INCORPORATED
C         TASK 23  STUDY OF WATER RESOURCE MANAGEMENT
C         APRIL 18, 1991
C
      INTEGER INF(10,2),NALT(2,300),SYSTAF(10),
     3 LOC(40),LOCT(40), MOC(40),NINF(3,40)
      REAL MGIN(2,7)
      CHARACTER*1 YN, REL(10)
      CHARACTER*2 TEM2A,TEM2B
      CHARACTER*4 TEM4
      CHARACTER*5 MON(5)
      CHARACTER*12   COMBFIL,ZOWDIN
      CHARACTER*50 DESIN,OUTFIL,INFILE
      DATA COMBFIL/'ZOWDCOMB.DAT'/,ZOWDIN/'ZOWDIN2.DAT '/
C
C     ***  ARRAY DESCRIPTIONS  ***
C
C     NALT(I,K)  "ID sequence for each Task/Alternative"
C                I = 1 --> Task Number [Usually 1 to 30]
C                  = 2 --> Alternative Number for Task [0 to 99]
C                K = 1 to 100 Task/Alternative sequence number
C     SYSTAF(K)  "Temporary array to read systems affected
C                 by influencing task from dBase file"
C                K = 1 TO 10
C     MGIN(L,M)  "Temporary array to read from dBase file the
C                 MGY and CONF (L = 1 and 2) for each of M
C                 systems."
C     LOC(K)          "Starting sequence Number for Task K (see NALT)"
C     LOCT(K)    "Sequence number for each alternative within
C                  Task K." (changes in a DO-loop during
C                  evaluation of each combination of Task/alternatives"
C      MOC(K)         "Number of Alternatives for Task K"
C
C     *** MAIN I/O ROUTINE ***
C
```

```
      DO 5 I=1,2
      DO 5 J=1,300
5     NALT(I,J)=0
      NT=0
      NTS = 0
      NP1 = -1
      NP2 = -1
      WRITE(*,12)
12    FORMAT(///,20X,'ZERO-OFFSITE WATER-DISCHARGE PLAN',//,
     1           20X,'     Decision Support System',///,
     2           20X,'          PROGRAM COMB',//)
55    WRITE(*,60)
60    FORMAT(5X,'Enter COMBIN. OUTPUT FILE pathname (ZOWDCOMB.DAT): '\)
      READ(*,62)OUTFIL
62    FORMAT(A)
      IF((INDEX(OUTFIL,' ')-1).EQ.0) OUTFIL=COMBFIL
      OPEN(UNIT=10,ERR=70,FILE=OUTFIL,MODE='WRITE',STATUS='UNKNOWN')
      GO TO 90
70    WRITE(*,72)OUTFIL
72    FORMAT(5X,'Unable to open file ',A)
      GO TO 55
90    WRITE(*,100)
100   FORMAT(5X,'Enter INPUT FILE pathname (ZOWDIN2.DAT): ',\)
      READ(*,62)INFILE
      IF((INDEX(INFILE,' ')-1).EQ.0) INFILE=ZOWDIN
      OPEN(UNIT=11,ERR=105,FILE=INFILE,MODE='READ',STATUS='OLD')
      GO TO 110
105   WRITE(*,72)INFILE
      GO TO 90
110   WRITE(*,115)INFILE,OUTFIL
115   FORMAT(/5X,'You have specified input file (from dBase): ',
     1 A12,/17X,'and output (Combinations) file: ',A12,//
     2 5X, 'Do you wish to change these? (Y/N): '\)
      READ(*,'(A)')YN
      IF(YN.EQ.'Y'.OR.YN.EQ.'y') GO TO 55
C
C             READ IN DATA FOR ALL TASK/ALTERNATIVES
C             DATA COMES FROM dBASE FILE
C
120   READ(11,300,END=350)N1,N2,DESIN,TEM4,TEM2A,TEM2B,
     1((MGIN(J,I),J=1,2),I=1,7),FINAN,IMPENV,
     2((INF(K,L),L=1,2),SYSTAF(K),REL(K),K=1,10),(MON(M),M=1,5)
300   FORMAT(I3,I2,A50,A4,2A2,7(F7.1,F4.0),F6.0,I3,
     1 10(I3,I2,I1,A1),5A5)
      IF(N1.LT.NP1)GO TO 350
```

```
      IF(N1.EQ.NP1.AND.N2.EQ.NP2)GO TO 120
      NT = NT + 1
      NALT(1,NT) = N1
      NALT(2,NT) = N2
      NP1 = N1
      NP2 = N2
      IF(NTS.EQ.0) GO TO 301
      IF(N1.EQ.NALT(1,NT-1)) GO TO 120
301   NTS = NTS + 1
      LOC(NTS) = NT
      GO TO 120
C
C        DETERMINE POSSIBLE COMBINATIONS
C        OF TASK/ALTERNATIVES
C
350   DO 351 I = 2,NTS
351   MOC(I-1) = LOC(I) - LOC(I-1)
      MOC(NTS) = NT - LOC(NTS) + 1
      NOC = 1
      DO 352 I = 1,NTS
      IF(NOC.LT.1000)GO TO 352
      KA=INDEX(INFILE,' ')-1
      WRITE(*,3511)INFILE(1:KA)
3511  FORMAT(/5X,'*** Warning; more than 1000 combinations found.'/,
     1 7X, 'Check that file ',A,' is sorted properly.'//,
     27X,'Do you wish to continue with first 1000 combinations? (Y/N)'\)
      READ(*,'(A)')YN
      IF(YN.EQ.'Y'.OR.YN.EQ.'y') GO TO 3521
      STOP
352   NOC = NOC * MOC(I)
3521  IF(IP.EQ.2)WRITE(10,353)NOC
      WRITE(*,353)NOC
353   FORMAT(/5X,'There are',I10,' possible alternative combinations.')
      PAUSE
      WRITE(*,3562)
3562  FORMAT(//,10X,'*** PROCESSING BEGINS ***'/)
      NLOCS=0
      WRITE(10,354)NOC,NTS
354   FORMAT(2I5)
      DO 8000 I1=1,NTS
      DO 7990 J1=1,MOC(I1)
      LOCT(I1)=LOC(I1)+J1-1
      K2=I1+1
      IF(K2.LE.NTS) GO TO 3400
      IF(NTS.GT.1)GO TO 7990
```

```
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
6100  FORMAT(5X,'Comb:',I4,' LOCT=',15I4,/(20X,15I4))
7050  FORMAT(60I4)
      IF(NLOCS.EQ.NOC) STOP
      GO TO 7990
3400  DO 7980 I2=K2,NTS
      DO 7970 J2=1,MOC(I2)
      LOCT(I2)=LOC(I2)+J2-1
      K3=I2+1
      IF(K3.LE.NTS) GO TO 3410
      IF(NTS.GT.2)GO TO 7970
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7970
3410  DO 7960 I3=K3,NTS
      DO 7950 J3=1,MOC(I3)
      LOCT(I3)=LOC(I3)+J3-1
      K4=I3+1
      IF(K4.LE.NTS) GO TO 3420
      IF(NTS.GT.3)  GO TO 7950
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7950
3420  DO 7940 I4=K4,NTS
      DO 7930 J4=1,MOC(I4)
      LOCT(I4)=LOC(I4)+J4-1
      K5=I4+1
      IF(K5.LE.NTS) GO TO 3430
      IF(NTS.GT.4)  GO TO 7930
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7930
3430  DO 7920 I5=K5,NTS
      DO 7910 J5=1,MOC(I5)
      LOCT(I5)=LOC(I5)+J5-1
      K6=I5+1
      IF(K6.LE.NTS) GO TO 3440
```

```
      IF(NTS.GT.5)  GO TO 7910
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7910
3440  DO 7900 I6=K6,NTS
      DO 7890 J6=1,MOC(I6)
      LOCT(I6)=LOC(I6)+J6-1
      K7=I6+1
      IF(K7.LE.NTS) GO TO 3450
      IF(NTS.GT.6)  GO TO 7890
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7890
3450  DO 7880 I7=K7,NTS
      DO 7870 J7=1,MOC(I7)
      LOCT(I7)=LOC(I7)+J7-1
      K8=I7+1
      IF(K8.LE.NTS)GO TO 3460
      IF(NTS.GT.7)  GO TO 7870
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7870
3460  DO 7860 I8=K8,NTS
      DO 7850 J8=1,MOC(I8)
      LOCT(I8)=LOC(I8)+J8-1
      K9=I8+1
      IF(K9.LE.NTS) GO TO 3470
      IF(NTS.GT.8)  GO TO 7850
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7850
3470  DO 7840 I9=K9,NTS
      DO 7830 J9=1,MOC(I9)
      LOCT(I9)=LOC(I9)+J9-1
      K10=I9+1
      IF(K10.LE.NTS) GO TO 3480
      IF(NTS.GT.9)   GO TO 7830
```

```
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7830
3480  DO 7820 I10=K10,NTS
      DO 7810 J10=1,MOC(I10)
      LOCT(I10)=LOC(I10)+J10-1
      K11=I10+1
      IF(K11.LE.NTS) GO TO 3490
      IF(NTS.GT.10)  GO TO 7810
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7810
3490  DO 7800 I11=K11,NTS
      DO 7790 J11=1,MOC(I11)
      LOCT(I11)=LOC(I11)+J11-1
      K12=I11+1
      IF(K12.LE.NTS) GO TO 3500
      IF(NTS.GT.11)  GO TO 7790
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7790
3500  DO 7780 I12=K12,NTS
      DO 7770 J12=1,MOC(I12)
      LOCT(I12)=LOC(I12)+J12-1
      K13=I12+1
      IF(K13.LE.NTS) GO TO 3510
      IF(NTS.GT.12)  GO TO 7770
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7770
3510  DO 7760 I13=K13,NTS
      DO 7750 J13=1,MOC(I13)
      LOCT(I13)=LOC(I13)+J13-1
      K14=I13+1
      IF(K14.LE.NTS) GO TO 3520
      IF(NTS.GT.13)  GO TO 7750
      NLOCS=NLOCS+1
```

```
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7750
3520  DO 7740 I14=K14,NTS
      DO 7730 J14=1,MOC(I14)
      LOCT(I14)=LOC(I14)+J14-1
      K15=I14+1
      IF(K15.LE.NTS) GO TO 3530
      IF(NTS.GT.14)  GO TO 7730
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7730
3530  DO 7720 I15=K15,NTS
      DO 7710 J15=1,MOC(I15)
      LOCT(I15)=LOC(I15)+J15-1
      K16=I15+1
      IF(K16.LE.NTS) GO TO 3540
      IF(NTS.GT.15)  GO TO 7710
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7710
3540  DO 7700 I16=K16,NTS
      DO 7690 J16=1,MOC(I16)
      LOCT(I16)=LOC(I16)+J16-1
      K17=I16+1
      IF(K17.LE.NTS) GO TO 3550
      IF(NTS.GT.16)  GO TO 7690
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7690
3550  DO 7680 I17=K17,NTS
      DO 7670 J17=1,MOC(I17)
      LOCT(I17)=LOC(I17)+J17-1
      K18=I17+1
      IF(K18.LE.NTS) GO TO 3560
      IF(NTS.GT.17)  GO TO 7670
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
```

```
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7670
3560  DO 7660 I18=K18,NTS
      DO 7650 J18=1,MOC(I18)
      LOCT(I18)=LOC(I18)+J18-1
      K19=I18+1
      IF(K19.LE.NTS) GO TO 3570
      IF(NTS.GT.18)  GO TO 7650
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7650
3570  DO 7640 I19=K19,NTS
      DO 7630 J19=1,MOC(I19)
      LOCT(I19)=LOC(I19)+J19-1
      K20=I19+1
      IF(K20.LE.NTS) GO TO 3580
      IF(NTS.GT.19)  GO TO 7630
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 7630
3580  I20 = K20-1
3581  I20 = I20 + 1
      IF(I20.GT.NTS) GO TO 7630
      J20 = 0
3582  J20 = J20 + 1
      IF(J20.GT.MOC(I20)) GO TO 3581
      LOCT(I20)=LOC(I20)+J20-1
      K21=I20+1
      IF(K21.LE.NTS) GO TO 3590
      IF(NTS.GT.20)  GO TO 3582
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 3582
3590  I21 = K21-1
3591  I21 = I21 + 1
      IF(I21.GT.NTS) GO TO 3582
      J21 = 0
3592  J21 = J21 + 1
```

```
      IF(J21.GT.MOC(I21)) GO TO 3591
      LOCT(I21)=LOC(I21)+J21-1
      K22=I21+1
      IF(K22.LE.NTS) GO TO 3600
      IF(NTS.GT.21)  GO TO 3592
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 3592
3600  I22 = K22-1
3601  I22 = I22 + 1
      IF(I22.GT.NTS) GO TO 3592
      J22 = 0
3602  J22 = J22 + 1
      IF(J22.GT.MOC(I22)) GO TO 3601
      LOCT(I22)=LOC(I22)+J22-1
      K23=I22+1
      IF(K23.LE.NTS) GO TO 3610
      IF(NTS.GT.22)  GO TO 3602
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 3602
3610  I23 = K23-1
3611  I23 = I23 + 1
      IF(I23.GT.NTS) GO TO 3602
      J23 = 0
3612  J23 = J23 + 1
      IF(J23.GT.MOC(I23)) GO TO 3611
      LOCT(I23)=LOC(I23)+J23-1
      K24=I23+1
      IF(K24.LE.NTS) GO TO 3620
      IF(NTS.GT.23)  GO TO 3612
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 3612
3620  I24 = K24-1
3621  I24 = I24 + 1
      IF(I24.GT.NTS) GO TO 3612
      J24 = 0
3622  J24 = J24 + 1
```

```
      IF(J24.GT.MOC(I24)) GO TO 3621
      LOCT(I24)=LOC(I24)+J24-1
      K25=I24+1
      IF(K25.LE.NTS) GO TO 3630
      IF(NTS.GT.24)  GO TO 3622
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 3622
3630  I25 = K25-1
3631  I25 = I25 + 1
      IF(I25.GT.NTS) GO TO 3622
      J25 = 0
3632  J25 = J25 + 1
      IF(J25.GT.MOC(I25)) GO TO 3631
      LOCT(I25)=LOC(I25)+J25-1
      K26=I25+1
      IF(K26.LE.NTS) GO TO 3640
      IF(NTS.GT.25)  GO TO 3632
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 3632
3640  I26 = K26-1
3641  I26 = I26 + 1
      IF(I26.GT.NTS) GO TO 3632
      J26 = 0
3642  J26 = J26 + 1
      IF(J26.GT.MOC(I26)) GO TO 3641
      LOCT(I26)=LOC(I26)+J26-1
      K27=I26+1
      IF(K27.LE.NTS) GO TO 3650
      IF(NTS.GT.26)  GO TO 3642
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 3642
3650  I27 = K27-1
3651  I27 = I27 + 1
      IF(I27.GT.NTS) GO TO 3642
      J27 = 0
3652  J27 = J27 + 1
```

```
      IF(J27.GT.MOC(I27)) GO TO 3651
      LOCT(I27)=LOC(I27)+J27-1
      K28=I27+1
      IF(K28.LE.NTS) GO TO 3660
      IF(NTS.GT.27)  GO TO 3652
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 3652
3660  I28 = K28-1
3661  I28 = I28 + 1
      IF(I28.GT.NTS) GO TO 3652
      J28 = 0
3662  J28 = J28 + 1
      IF(J28.GT.MOC(I28)) GO TO 3661
      LOCT(I28)=LOC(I28)+J28-1
      K29=I28+1
      IF(K29.LE.NTS) GO TO 3670
      IF(NTS.GT.28)  GO TO 3662
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 3662
3670  I29 = K29-1
3671  I29 = I29 + 1
      IF(I29.GT.NTS) GO TO 3662
      J29 = 0
3672  J29 = J29 + 1
      IF(J29.GT.MOC(I29)) GO TO 3671
      LOCT(I29)=LOC(I29)+J29-1
      K30=I29+1
      IF(K30.LE.NTS) GO TO 3680
      IF(NTS.GT.29)  GO TO 3672
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 3672
3680  I30 = K30-1
3681  I30 = I30 + 1
      IF(I30.GT.NTS) GO TO 3672
      J30 = 0
3682  J30 = J30 + 1
```

```
      IF(J30.GT.MOC(I30)) GO TO 3681
      LOCT(I30)=LOC(I30)+J30-1
      K31=I30+1
      IF(K31.LE.NTS) GO TO 3690
      IF(NTS.GT.30)  GO TO 3682
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 3682
3690  I31 = K31-1
3691  I31 = I31 + 1
      IF(I31.GT.NTS) GO TO 3682
      J31 = 0
3692  J31 = J31 + 1
      IF(J31.GT.MOC(I31)) GO TO 3691
      LOCT(I31)=LOC(I31)+J31-1
      NLOCS=NLOCS+1
      WRITE(*,6100)NLOCS,(LOCT(LK),LK=1,NTS)
      WRITE(10,7050)(LOCT(LK),LK=1,NTS)
            IF(NLOCS.EQ.NOC) STOP
      GO TO 3692
7630  CONTINUE
7640  CONTINUE
7650  CONTINUE
7660  CONTINUE
7670  CONTINUE
7680  CONTINUE
7690  CONTINUE
7700  CONTINUE
7710  CONTINUE
7720  CONTINUE
7730  CONTINUE
7740  CONTINUE
7750  CONTINUE
7760  CONTINUE
7770  CONTINUE
7780  CONTINUE
7790  CONTINUE
7800  CONTINUE
7810  CONTINUE
7820  CONTINUE
7830  CONTINUE
7840  CONTINUE
7850  CONTINUE
```

```
7860  CONTINUE
7870  CONTINUE
7880  CONTINUE
7890  CONTINUE
7900  CONTINUE
7910  CONTINUE
7920  CONTINUE
7930  CONTINUE
7940  CONTINUE
7950  CONTINUE
7960  CONTINUE
7970  CONTINUE
7980  CONTINUE
7990  CONTINUE
8000  CONTINUE
      STOP
      END
```

B

APPENDIX B

ZOWD Program Code

```
C
C       DECISION SUPPORT PROGRAM - ZOWD
C       TO SUPPORT DECISION-MAKING FOR THE
C       ZERO-OFFSITE WATER-DISCHARGE PLAN AT ROCKY FLATS.
C       PROGRAMMER: A.F.BALLOFFET, BALLOFFET AND ASSOCIATES, INC.
C       UNDER CONTRACT TO ADVANCED SCIENCES, INCORPORATED
C       TASK 23  STUDY OF WATER RESOURCE MANAGEMENT
C       FEBRUARY 21, 1991
C       REV. 1, MARCH 24, 1991
C       REV. 2, APRIL 18, 1991
C
      INTEGER TYPE(3,2,100),IMPACT(3,100),INFBY(3,10,4,100),
     1 KEYS(6,15),INF(10,2),TSKEFF(2,30),NALT(2,100),
     2 OBJECT(2,6),TGROUP(15,3),KNUM(2,5),SYSTAF(10),
     3 LOC(100),LOCT(100),NINF(3,100),KNUMO(2,5),TSKEFO(2,30),
     4 MOC(100),LOCD(60,1000)
      REAL MGY(3,7,100),CONF(3,7,100),MGIN(2,7),COST(3,100),
     1 ACCUM(2,5,5),ACCUMO(2,5,5)
      COMMON DELTA,NTS,LOCT
      COMMON INFBY,MGY,CONF,NINF
      CHARACTER*1 X,YN,REL(10)
      CHARACTER*2 TEM2A,TEM2B
      CHARACTER*3 CMON(12),TKEY(3)
      CHARACTER*4 TIM(3),TEM4
      CHARACTER*5 MONIT(3,5,100),MON(5)
      CHARACTER*12 ZOWDIN
      CHARACTER*15 CAT(7)
      CHARACTER*23 GROUP(5)
      CHARACTER*25 GOALS(15)
      CHARACTER*50 DESC(100),DESIN,OUTFIL,INFILE
      DATA ZOWDIN/'ZOWDIN2.DAT '/
      DATA GOALS/  'Absolute Zero-Discharge  ',
     1             'Zero Waste Discharge     ',
     2             'BAT Treated Waste OK     ',
     3             'No point source discharge',
     4             'No ground water discharge',
     5             'No storm water discharge ',
     6           9*'                         '/
      DATA TYPE,IMPACT/900*0/
      DATA CMON /'Jan','Feb','Mar','Apr','May','Jun','Jul','Aug',
     1 'Sep','Oct','Nov','Dec'/
```

```
      DATA TKEY /'---','MAX','MIN'/,TIM/' NOW','5YR ','LT  '/
      DATA CAT/  'All Water      ',
     1           'Tot. Wastewater',
     2           'Point Sources  ',
     3           'Groundwater    ',
     4           'Surface Runoff ',
     5           'Domestic Waste ',
     6           'Misc. Losses   '/
      DATA TGROUP/ 1,10,11,12,13,18,19,20, 7*0,
     1             2,3,4,5,6,9,15,16,21,24,25,4*0,
     2             7,8,22,26,29,10*0/
      DATA GROUP/'I.   Wastewater Recycle',
     1           'II.  Storm Water       ',
     2           'III. Ground Water      ',
     3           'IV.  Water Management  ',
     4           'Total All Groups       '/
C
C     *** ARRAY DESCRIPTIONS ***
C
C     TYPE(I,J,K)      "Type of Task", for Time I, Dimension J, Task K.
C                 I = 1 --> NOW
C                   = 2 --> WITHIN 5 YEARS
C                   = 3 --> LONG RANGE
C                 J = 1 --> Data (Type 1) or Action (Type 2)
C                   = 2 --> Technology (Type 1) or Regulatory (Type 2)
C                 K = 1 TO 100 (TASK)
C     IMPACT(I,K)      "Environmental Impact" of Task K, at Time I
C     INFBY(I,L,M,K)  " Up to L = 10 Other Tasks influencing" Task K,
C                          for Time I.
C                 M = 1 (task number)
C                   = 2 (task alternative, if any)
C                   = 3 (primary system affected [Codes 1 to 7])
C                   = 4 (relationship [Codes A to E, entered in this
C                       array as 1 to 5])
C     NINF(I,K)  "Number of other tasks influencing Task K at Time I"
C     KEYS(I,J)  "Objective codes for Goal" J, system I
C                 I = 1 --> All Water
C                   = 2 --> All Waste Water
C                   = 3 --> Point Sources
C                   = 4 --> Ground Water
C                   = 5 --> Surface Runoff
C                   = 6 --> Domestic Waste Water
C                 [Codes are      1 = not applicable
C                           2 = Maximize reduction
C                           3 = Minimize reduction]
```

```
C     INF(L,I)    "Temporary array used to read in influencing tasks"
C     TSKEFF(I,J)      "Pointer array to identify Tasks which Support or
C                   Oppose Desired Goal for combination of tasks
C                        being analyzed"
C                  I = 1 --> Tasks which support goal
C                    = 2 --> Tasks which oppose goal
C     TSKEFO(I,J)      Same as TSKEFF for optimum combination
C     OBJECT(I,J)      "Pointer array to accumulate discrete set of
C                   up to 6 objectives for goal being analyzed"
C                  I = 1 --> indicates Maximize (code -1) or
C                            Minimize (code +1)
C                    = 2 --> indicates system [codes 1 to 6, see KEYS]
C                  J = 1 TO 6
C     TGROUP(J,I)      "Array which identifies up to 15 tasks
C                   for each of 4 groupings"
C                  J = 1 to 15
C                  I = 1 --> Wastewater Recycle Group
C                    = 2 --> Storm Water Group
C                    = 3 --> Ground Water Group
C                  (All tasks not defined in above groups are
C                  assigned to Group 4, Water Management, by default)
C     KNUM(I,J)   "Counter array to track how many tasks from
C                   each Group either support or oppose Goal for
C                   combination of tasks being analyzed"
C                  I = 1 --> Tasks which support Goal
C                    = 2 --> Tasks which oppose Goal
C                  J = 1 to 4 is Group Number
C                    = 5 is sum of all Groups
C     KNUMO(I,J)       Same as KNUM for optimum task combination
C     NALT(I,K)   "ID sequence for each Task/Alternative"
C                  I = 1 --> Task Number [Usually 1 to 30]
C                    = 2 --> Alternative Number for Task [0 to 99]
C                  K = 1 to 100 Task/Alternative sequence number
C     SYSTAF(K)   "Temporary array to read systems affected
C                   by influencing task from dBase file"
C                  K = 1 TO 10
C     MGY(I,J,K)       "Change in water discharging from RFP at time I,
C                   system J, and for task/alternative K"
C     CONF(I,J,K)      "Confidence factor applied to MGY reported for
C                   time I, system J, task/alternative K.  This
C                   factor is entered as a percent."
C     MGIN(L,M)   "Temporary array to read from dBase file the
C                   MGY and CONF (L = 1 and 2) for each of M
C                   systems."
C     COST(I,K)   "Total cost of task/alternative K for time I"
```

```
C     ACCUM(I,J,K)     "Array to accumulate information for a goal for
C                  combination of tasks being analyzed"
C                 I = 1 --> Task/alternatives which SUPPORT goal
C                   = 2 --> Task/alternatives which OPPOSE goal
C                 J = 1 --> Total MGY change
C                   = 2 --> "Discounted" MGY change [MGY*CONF]
C                   = 3 --> Total cost
C                   = 4 --> Average total environmental impact
C     ACCUMO(I,J,K)    Same as ACCUM for optimum task combination
C     LOC(K)             "Starting sequence Number for Task K (see NALT)"
C     LOCT(K)     "Sequence number for each alternative within
C                   Task K." (changes in a DO-loop during
C                   evaluation of each combination of Task/alternatives"
C      MOC(K)          "Number of Alternatives for Task K"
C
C     *** MAIN I/O ROUTINE ***
C
      ISTART=1
      DO 5 I=1,2
      DO 5 J=1,100
5     NALT(I,J)=0
      DO 7 I = 1,3
      DO 7 J = 1,10
      DO 7 K = 1,4
      DO 7 L = 1,100
7     INFBY(I,J,K,L) = 0
      DO 10 I=1,6
      DO 10 J=1,15
10    KEYS(I,J)=1
      KEYS(1,1)=2
      KEYS(2,2)=2
      KEYS(2,3)=3
      KEYS(3,4)=2
      KEYS(4,5)=2
      KEYS(5,6)=2
      DO 11 I = 1,3
      DO 11 J = 1,7
      DO 11 K = 1, 100
      CONF(I,J,K)=0.
11    MGY(I,J,K) = 0.
C        READ GOAL DATA (IF FIRST RUN, USE DEFAULT DATA ABOVE)
      MG=6
      NT=0
      NTS = 0
      NP1 = -1
```

```
      NP2 = -1
      WRITE(*,12)
12    FORMAT(///,20X,'ZERO-OFFSITE WATER-DISCHARGE PLAN',//,
     1           20x,'     Decision Support System',///,
     25X,'Use Default Goal Data? (Mandatory for first run)(Y/N) :'\)
      OPEN(UNIT=13,ERR=30,FILE='ZOWDSYST',MODE='READWRITE',
     1 STATUS='UNKNOWN')
      READ(*,'(A)')YN
      IF(YN.EQ.'Y'.OR.YN.EQ.'y') GO TO 30
      READ(13,20)MG,GOALS,KEYS
20    FORMAT(I5,/,15(A25/),15(10I5/))
      REWIND 12
30    IP=1
      WRITE(*,50)
50    FORMAT(5X,'Would you like to save your output on disk? (Y/N) ',\)
      READ(*,'(A)')YN
      IF(YN.NE.'Y'.AND.YN.NE.'y') GO TO 90
55    WRITE(*,60)
60    FORMAT(5X,'Enter the pathname of your OUTPUT FILE: '\)
      READ(*,62)OUTFIL
62    FORMAT(A)
      IF((INDEX(OUTFIL,' ')-1).EQ.0) GO TO 90
      OPEN(UNIT=10,ERR=70,FILE=OUTFIL,MODE='WRITE',STATUS='UNKNOWN')
      CALL GETDAT(IYR,IMON,IDAY)
      CALL GETTIM(IHR,IMIN,ISEC,I100TH)
      WRITE(10,65)IDAY,CMON(IMON),IYR,IHR,IMIN,OUTFIL
65    FORMAT(5X,'ZOWD PROGRAM OUTPUT FOR SESSION ON ',I2,1X,A3,', ',I4,
     1'  AT ',I2.2,':',I2.2,/,5X,'OUTPUT FILE: ',A,//)
      IP=2
      GO TO 90
70    WRITE(*,72)OUTFIL
72    FORMAT(5X,'Unable to open file ',A)
      GO TO 55
90    WRITE(*,100)
100   FORMAT(5X,'Enter the INPUT FILE pathname (ZOWDIN2.DAT):',\)
      IF(IP.EQ.2)WRITE(10,100)
      READ(*,62)INFILE
      IF((INDEX(INFILE,' ')-1).EQ.0) INFILE = ZOWDIN
      IF(IP.EQ.2)WRITE(10,*)INFILE
      OPEN(UNIT=11,ERR=105,FILE=INFILE,MODE='READ',STATUS='OLD')
      GO TO 110
105   WRITE(*,72)INFILE
      IF(IP.EQ.2)WRITE(10,72)
      GO TO 90
110   OPEN(UNIT=12,ERR=115,FILE='ZOWDCOMB.DAT',MODE='READ',STATUS='OLD')
```

```
      GO TO 120
115   WRITE(*,117)
117   FORMAT(/'   Combinations file (ZOWDCOMB.DAT) missing')
      STOP
120   WRITE(*,125)
      IF(IP.EQ.2)WRITE(10,125)
125   FORMAT(//5X,'****  GOAL SETTING PROCESS ****',///
     1 5X,'The following goals are available:'/)
      DO 130 I = 1,MG
      IF(IP.EQ.2)WRITE(10,135)I,GOALS(I)
130   WRITE(*,135) I,GOALS(I)
135   FORMAT(I10,3X,A)
      IF(IP.EQ.2)WRITE(10,140)
      WRITE(*,140)
140   FORMAT(/' Goals Seek to Maximize/Minimize Discharge Reduction'
     1,' as Follows:',//,
     27X,'|---------------------- Objectives ----------------------',/
     3' Goal  |   All     Waste     Point    Ground   Surface      Dom.'
     4/7x,'| Water     Water    Sources    Water    Runoff     Waste'/)
      DO 150 I = 1,MG
      IF(IP.EQ.2)WRITE(10,155)I,(TKEY(KEYS(J,I)),J=1,6)
150   WRITE(*,155)I,(TKEY(KEYS(J,I)),J=1,6)
155   FORMAT(I3,6A10)
      IF(IP.EQ.2)WRITE(10,160)
      WRITE(*,160)
160   FORMAT(/5X,'## Do you wish to change these, or add a goal? (Y/N)'
     1\)
      READ(*,'(A)')YN
      IF(IP.EQ.2)WRITE(10,62)YN
      IF(YN.NE.'Y'.AND.YN.NE.'y') GO TO 220
162   IF(IP.EQ.2)WRITE(10,165)
      WRITE(*,165)
165   FORMAT(5X,'## Enter the Goal number to be changed.',/
     1 8X,'(for a new goal enter next available number - max 15):',\)
      READ(*,*,ERR=170)NG
      IF(IP.EQ.2)WRITE(10,*)NG
      IF(NG.GE.1.AND.NG.LT.16)GO TO 180
170   WRITE(*,175)
      IF(IP.EQ.2)WRITE(10,175)
175   FORMAT(10X,'Sorry, you must enter a number between 1 and 15.')
      GO TO 162
180   IF(NG.LE.MG) GO TO 190
      IF(IP.EQ.2) WRITE(10,182)
      WRITE(*,182)
182   FORMAT(5X,'## New Goal Description:'\)
```

```
      READ(*,62)GOALS(NG)
      IF(IP.EQ.2)WRITE(10,62)GOALS(NG)
190   IF(IP.EQ.2)WRITE(10,192)NG,GOALS(NG)
      WRITE(*,192)NG,GOALS(NG)
192   FORMAT(/5X,'*** Goal: ',I3,3X,A,//
     15X,'Enter an Objective Code for Each Category Below.',/
     25x,'  Codes are as follows:'/
     35x,'      1  =  Not important/applicable for this goal.'/
     45x,'      2  =  Maximize Discharge Reduction in this category.'/
     55x,'      3  =  Minimize Reduction (i.e. increase discharge).'/)
      DO 205 I = 1,6
196   IF(IP.EQ.2)WRITE(10,197)CAT(I)
      WRITE(*,197)CAT(I)
197   FORMAT(10X,'Category: ',A,'  Code:'\)
      READ(*,*,ERR=199)NC
      IF(IP.EQ.2)WRITE(10,*)NC
      IF(NC.GE.1.AND.NC.LT.4)GO TO 203
199   WRITE(*,200)
      IF(IP.EQ.2)WRITE(10,200)
200   FORMAT(10X,'Sorry, you must enter a Code between 1 and 3.')
      GO TO 196
203   KEYS(I,NG)=NC
C
C       CHECK FOR INCOMPATIBLE OR REDUNDANT  OBJECTIVES
C
      IF(I.EQ.1.AND.NC.NE.1)GO TO 210
      IF(I.EQ.3.AND.KEYS(2,NG).NE.1)KEYS(3,NG)=1
      IF(I.EQ.6.AND.KEYS(2,NG).NE.1)KEYS(6,NG)=1
205   CONTINUE
210   IF(MG.LT.NG)MG=NG
      GO TO 120
C         GOAL LIST ESTABLISHED.  NOW SELECT A GOAL FOR THIS RUN
C
220   IF(IP.EQ.2)WRITE(10,230)MG
      WRITE(*,230)MG
230   FORMAT(/,5X,'## Select a Goal (A number from 1 to',I3,'):'\)

      READ(*,*,ERR=235)IG
      IF(IP.EQ.2)WRITE(10,*)IG
      IF(IG.GE.1.AND.IG.LE.MG)GO TO 250
235   WRITE(*,240)MG
      IF(IP.EQ.2)WRITE(10,240)MG
240   FORMAT(10X,'Sorry, you must enter a number between 1 and',I3)
      GO TO 220
C           A VALID GOAL HAS BEEN SELECTED.  SPECIFY OBJECTIVES
```

```
250   MK = 0
      DO 252 I = 1,6
      IF(KEYS(I,IG).EQ.1)GO TO 252
      MK=MK+1
      OBJECT(1,MK)=-1
      IF(KEYS(I,IG).EQ.3)OBJECT(1,MK)=1
      OBJECT(2,MK)=I
252   CONTINUE
C          SPECIFY A TIME (NOW, 5 YEARS, LONG TERM)
258   IF(IP.EQ.2)WRITE(10,260)
      WRITE(*,260)
260   FORMAT(/5X,'Please specify a time period for this goal.'/
     110X,'Choices are:'/
     215X,'1  =  Immediate (FY 1991/92)',/
     315X,'2  =  Short-term (Within next five years)',/
     415X,'3  =  Long term (Beyond five years)',//
     55X,'## Enter Time Period (1 to 3):'\)
      READ(*,*,ERR=270)ITIME
      IF(IP.EQ.2)WRITE(10,*)ITIME
      IF(ITIME.GE.1.AND.ITIME.LT.4)GO TO 272
270   WRITE(*,271)
      IF(IP.EQ.2)WRITE(10,271)
271   FORMAT(10X,'Sorry, you must enter a number between 1 and 3')
      GO TO 258
272   IF(IP.EQ.2)WRITE(10,273)
273   FORMAT(5X,'Use Low Cost as an additional objective? (Y/N)',\)
      WRITE(*,273)
      LCOST=1
      READ(*,'(A)')YN
      IF(IP.EQ.2)WRITE(10,62)YN
      IF(YN.EQ.'Y'.OR.YN.EQ.'y') LCOST=2
C
C             READ IN DATA FOR ALL TASK/ALTERNATIVES
C             DATA COMES FROM dBASE FILE
C
280   IF(ISTART.EQ.2)GO TO 350
      READ(11,300,END=350)N1,N2,DESIN,TEM4,TEM2A,TEM2B,
     1((MGIN(J,I),J=1,2),I=1,7),FINAN,IMPENV,
     2((INF(K,L),L=1,2),SYSTAF(K),REL(K),K=1,10),(MON(M),M=1,5)
300   FORMAT(I3,I2,A50,A4,2A2,7(F7.1,F4.0),F6.0,I3,
     1 10(I3,I2,I1,A1),5A5)
      IF(N1.LT.NP1) GO TO 350
      IF(N1.EQ.NP1.AND.N2.EQ.NP2) GO TO 303
      NT = NT + 1
      NALT(1,NT) = N1
```

```
      NALT(2,NT) = N2
      NP1 = N1
      NP2 = N2
      DESC(NT) = DESIN
      IF(NTS.EQ.0) GO TO 301
      IF(N1.EQ.NALT(1,NT-1)) GO TO 303
301   NTS = NTS + 1
      LOC(NTS) = NT
303   DO 305 I=1,3
      IF(TEM4.EQ.TIM(I))GO TO 310
305   CONTINUE
310   ITI = I
      TYPE(ITI,1,NT)=1
      IF(TEM2A.EQ.'A ')TYPE(ITI,1,NT)=2
      TYPE(ITI,2,NT)=1
      IF(TEM2B.EQ.'R ')TYPE(ITI,2,NT)=2
      DO 320 I= 1,7
      MGY(ITI,I,NT)=MGIN(1,I)
320   CONF(ITI,I,NT)=MGIN(2,I)
      COST(ITI,NT)=FINAN
      IMPACT(ITI,NT)=IMPENV
      DO 330 I = 1,10
      IF(INF(I,1).EQ.0) GO TO 331
      INFBY(ITI,I,1,NT) = INF(I,1)
      INFBY(ITI,I,2,NT) = INF(I,2)
      INFBY(ITI,I,3,NT) = SYSTAF(I)
      INFBY(ITI,I,4,NT) = 5
      IF(REL(I).EQ.'A'.OR.REL(I).EQ.'a') INFBY(ITI,I,4,NT) = 1
      IF(REL(I).EQ.'B'.OR.REL(I).EQ.'b') INFBY(ITI,I,4,NT) = 2
      IF(REL(I).EQ.'C'.OR.REL(I).EQ.'c') INFBY(ITI,I,4,NT) = 3
330   IF(REL(I).EQ.'D'.OR.REL(I).EQ.'d') INFBY(ITI,I,4,NT) = 4
      I = 11
331   NINF(ITI,NT) = I-1
      DO 335 I = 1,5
335   MONIT(ITI,I,NT) = MON(I)
      GO TO 280
C
C        BEGIN PROCESSING THIS TASK/ALTERNATIVE
C        FIRST DETERMINE POSSIBLE COMBINATIONS
C        OF TASK/ALTERNATIVES RELEVANT TO
C        THIS GOAL-SET
C
350   IF(ISTART.EQ.2)GO TO 3561
      READ(12,351)NLOCS,NTT
351   FORMAT(2I5)
```

```
      DO 3541 I = 1,NLOCS
      READ(12,3531)(LOCD(J,I),J=1,NTT)
3531  FORMAT(60I4)
3541  CONTINUE
      REWIND 12
      IF(NTS.EQ.NTT) GO TO 3543
      IF(IP.EQ.2)WRITE(10,3542)NTS,INFILE,NTT
      WRITE(*,3542) NTS,INFILE,NTT
3542  FORMAT(/5X,I5,' Tasks in File ',A,/
     1        5X,I5,' Tasks in File ZOWDCOMB.DAT',/
     2        5X,'Smaller Number will be used',/)
      IF(NTS.LT.NTT) NTT = NTS
      IF(NTT.LT.NTS) NTS = NTT
3543  IF(IP.EQ.2)WRITE(10,353)NLOCS
      WRITE(*,353)NLOCS
353   FORMAT(/5X,'There are',I10,' possible alternative combinations.',
     1/5X,'Would you like intermediate results written to disk? (Y/N)'\)
      READ(*,'(A)') YN
      IP2 = 1
      IF(IP.EQ.2)WRITE(10,62)YN
      IF(YN.EQ.'Y'.OR.YN.EQ.'y')IP2 = 2
      IF(IP.EQ.2) GO TO 3561
      IF(IP2.EQ.1) GO TO 3561
354   WRITE(*,60)
      READ(*,62) OUTFIL
      IF((INDEX(OUTFIL,' ')-1).EQ.0) GO TO 356
      OPEN(UNIT=10,ERR=355,FILE=OUTFIL,MODE='WRITE',STATUS='UNKNOWN')
      CALL GETDAT(IYR,IMON,IDAY)
      CALL GETTIM(IHR,IMIN,ISEC,I100TH)
      WRITE(10,65) IDAY,CMON(IMON),IYR,IHR,IMIN,OUTFIL
      GO TO 356
355   WRITE(*,72) OUTFIL
      GO TO 354
356   IP2 = 1
3561  IF(IP.EQ.2) WRITE(10,3562)
      WRITE(*,3562)
3562  FORMAT(//,10X,'*** PROCESSING BEGINS ***'/)
C
C          SET UP ARRAY POINTER FOR VALID "INFLUENCING TASKS"
C
      IF(ISTART.EQ.2) GO TO 3522
      DO 3521 K = 1,NT
      DO 3521 I = 1,3
      IF(NINF(I,K).EQ.0) GO TO 3521
      J1 = NINF(I,K)
```

```
      DO 3520 J = 1,J1
      DO 3500 M = 1,NT
      IF(NALT(1,M).EQ.INFBY(I,J,1,K).AND.
     1   NALT(2,M).EQ.INFBY(I,J,2,K))  GO TO 3515
3500  CONTINUE
      IF(IP.EQ.2) WRITE(10,3510) INFBY(I,J,1,K),INFBY(I,J,2,K),I,
     1   NALT(1,K),NALT(2,K)
      WRITE(*,3510) INFBY(I,J,1,K),INFBY(I,J,2,K),I,
     1   NALT(1,K),NALT(2,K)
3510  FORMAT(/5X,'Invalid Influencing Task/Alternative:',2I5,
     1/5x,' Specified for time:',I2,', Task/Alt:',2I3,
     2/5x,' Will be ignored for this run.')
      INFBY(I,J,3,K) = -1
      INFBY(I,J,1,K) = LOC(M)
      GO TO 3520
3515  INFBY(I,J,1,K) = M
3520  CONTINUE
3521  CONTINUE
C
C          INITIALIZE ACCUMULATOR FOR OPTIMUM ZOWD
C
3522  ACO = 1E10
      ACOST=1E10
      IF(OBJECT(1,1).EQ.1) ACO=-1E10
      KK = 0
      DO 550 II = 1,NLOCS
      DO 3529 JJ = 1,NTT
3529  LOCT(JJ) = LOCD(JJ,II)
      IF(IP.EQ.2) WRITE(10,3530) II
      WRITE(*,3530) II
3530  FORMAT(5X,'Processing Combination:',I6)
      DO 358 I = 1,5
      KNUM(1,I)=0
      KNUM(2,I)=0
      DO 358 J = 1,5
      ACCUM(1,I,J) = 0.
358   ACCUM(2,I,J) = 0.
      DO 359 I = 1,30
      TSKEFF(1,I) = 0
359   TSKEFF(2,I) = 0
      NTF1 = 0
      NTF2 = 0
      DO 372 M = 1,NTS
      N = LOCT(M)
      DO 360 J = 1,15
```

```
      DO 360 K = 1,3
      IF(NALT(1,N).EQ.TGROUP(J,K)) GO TO 361
360   CONTINUE
      K = 4
361   IGP = K
C
C         CHECK WHETHER THIS TASK HAS A DELTA MGY FOR EACH OBJECTIVE
C
      KP = 1
      DO 370 K = 1,MK
      DELTA = MGY(ITIME,OBJECT(2,K),N)
C
C          CHECK TASK RELATIONSHIP TO OTHER TASKS
C          AND SELECT OPTIMAL DELTA
C
      IF(DELTA.EQ.0.) GO TO 370
      CALL RELAT(OBJECT(2,K),ITIME,N)
      IF(DELTA.EQ.0.)GO TO 370
      IF(KP.NE.1) GO TO 3630
      IF(IP2.EQ.2)WRITE(10,3620) NALT(1,N),NALT(2,N)
3620  FORMAT(/10X,'Task',I3,'; Alternative',I3)
      KP = 2
3630  IF(ABS(DELTA)/DELTA.EQ.OBJECT(1,K))GO TO 365
      ACCUM(2,1,IGP)=ACCUM(2,1,IGP)+DELTA
      ACCUM(2,1,5  )=ACCUM(2,1,5  )+DELTA
      ACCUM(2,2,IGP)=ACCUM(2,2,IGP)+DELTA*CONF(ITIME,OBJECT(2,K),N)/100
      ACCUM(2,2,5  )=ACCUM(2,2,5  )+DELTA*CONF(ITIME,OBJECT(2,K),N)/100
      ACCUM(2,3,IGP)=ACCUM(2,3,IGP)+COST(ITIME,N)
      ACCUM(2,3,5  )=ACCUM(2,3,5  )+COST(ITIME,N)
      ACCUM(2,4,IGP)=ACCUM(2,4,IGP)+IMPACT(ITIME,N)
      ACCUM(2,4,5  )=ACCUM(2,4,5  )+IMPACT(ITIME,N)
      KNUM(2,IGP)=KNUM(2,IGP)+1
      KNUM(2,5)=KNUM(2,5)+1
      IF(NTF2.EQ.0) GO TO 363
      IF(TSKEFF(2,NTF2).EQ.N)GO TO 370
363   NTF2 = NTF2 + 1
      TSKEFF(2,NTF2) = N
      GO TO 370
365   ACCUM(1,1,IGP)=ACCUM(1,1,IGP)+DELTA
      ACCUM(1,1,5  )=ACCUM(1,1,5  )+DELTA
      ACCUM(1,2,IGP)=ACCUM(1,2,IGP)+DELTA*CONF(ITIME,OBJECT(2,K),N)/100
      ACCUM(1,2,5  )=ACCUM(1,2,5  )+DELTA*CONF(ITIME,OBJECT(2,K),N)/100
      ACCUM(1,3,IGP)=ACCUM(1,3,IGP)+COST(ITIME,N)
      ACCUM(1,3,5  )=ACCUM(1,3,5  )+COST(ITIME,N)
      ACCUM(1,4,IGP)=ACCUM(1,4,IGP)+IMPACT(ITIME,N)
```

```
      ACCUM(1,4,5  )=ACCUM(1,4,5  )+IMPACT(ITIME,N)
      KNUM(1,IGP)=KNUM(1,IGP)+1
      KNUM(1,5)=KNUM(1,5)+1
      IF(NTF1.EQ.0) GO TO 367
      IF(TSKEFF(1,NTF1).EQ.N)GO TO 370
367   NTF1 = NTF1 + 1
      TSKEFF(1,NTF1) = N
370   CONTINUE
372   CONTINUE
C
C          SAVE "OPTIMAL" ACCUMULATION AND TASK/ALT ID
C
      IF(OBJECT(1,1).EQ.-1) GO TO 387
      IF(ACO.LE.(ACCUM(1,1,5)+ACCUM(2,1,5))) GO TO 390
375   ACO = ACCUM(1,1,5) + ACCUM(2,1,5)
      ACOST = ACCUM(1,3,5) + ACCUM(2,3,5)
      DO 380 I =1,5
      KNUMO(1,I) = KNUM(1,I)
      KNUMO(2,I) = KNUM(2,I)
      DO 380 J = 1,5
      ACCUMO(1,I,J) = ACCUM(1,I,J)
380   ACCUMO(2,I,J) = ACCUM(2,I,J)
      DO 385 I = 1,30
      TSKEFO(1,I) = TSKEFF(1,I)
385   TSKEFO(2,I) = TSKEFF(2,I)
      NTFO1 = NTF1
      NTFO2 = NTF2
      GO TO 400
387   IF(ACO.GT.(ACCUM(1,1,5) + ACCUM(2,1,5))) GO TO 375
390   IF(ACO.NE.(ACCUM(1,1,5) + ACCUM(2,1,5))) GO TO 400
      IF(LCOST.EQ.1)GO TO 400
C
C          CHECK FOR LOW COST
C
      IF (ACOST.GT.(ACCUM(1,3,5)+ACCUM(2,3,5)))GO TO 375
C
C        OBJECTIVES CHECKED FOR ALL TASKS.  PRINT RESULTS FOR
C          THIS COMBINATION, IF REQUESTED
C
400   IF(IP2.EQ.2)WRITE(10,410) IG,GOALS(IG)
410   FORMAT(///,5X,' **** Goal Selected is:',I3,2X,A25/)
      IF(NTF1.GT.0)GO TO 415
      IF(IP2.EQ.2)WRITE(10,412)
412   FORMAT(5X,'*** NO ACTIONS FOUND WHICH SUPPORT THIS GOAL.'/)
      GO TO 450
```

```
415   IF(IP2.EQ.2)WRITE(10,416)
416   FORMAT(
     1 5X,'Actions which SUPPORT the objectives of this goal are:',/)
      DO 430 I = 1,NTF1
      M = TSKEFF(1,I)
      IF(IP2.EQ.2)WRITE(10,420)NALT(1,M),NALT(2,M),DESC(M)
420   FORMAT(5X,2I3,2X,A)
430   CONTINUE
      DO 445 J = 1,5
      IF(KNUM(1,J).EQ.0)GO TO 445
      ACCUM(1,4,J)=ACCUM(1,4,J)/KNUM(1,J)
      IF(IP2.EQ.2)WRITE(10,440)GROUP(J),(ACCUM(1,I,J),I=1,4)
440   FORMAT(/2X,A23,/
     1       5X,'Total change in Offsite Water Discharge:',F10.1,' MGY'
     2/,5X,     'Minimum change with confidence factor:  ',F10.1,' MGY'
     3/,5X,     'Approximate Total Cost ($ millions):    ',F10.2,
     4/, 5X,    'Average environmental impact code (0-10)',F10.2/)
445   CONTINUE
450   IF(NTF2.GT.0) GO TO 515
      IF(IP2.EQ.2)WRITE(10,512)
512   FORMAT(5X,'*** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.'/)
      GO TO 550
515   IF(IP2.EQ.2)WRITE(10,516)
516   FORMAT(//
     1 5X,'Actions which OPPOSE the objectives of this goal are:',/)
      DO 530 I = 1,NTF2
      M = TSKEFF(2,I)
      IF(IP2.EQ.2)WRITE(10,420)NALT(1,M),NALT(2,M),DESC(M)
530   CONTINUE
      DO 545 J=1,5
      IF(KNUM(2,J).EQ.0)GO TO 545
      ACCUM(2,4,J)=ACCUM(2,4,J)/KNUM(2,J)
      IF(IP2.EQ.2)WRITE(10,440)GROUP(J),(ACCUM(2,I,J),I=1,4)
545   CONTINUE
550   CONTINUE
C
C          DISPLAY OPTIMAL RESULTS FOR THIS GOAL
C
      IF(IP.EQ.2)WRITE(10,410) IG,GOALS(IG)
      WRITE(*,410) IG,GOALS(IG)
      IF(IP.EQ.2)WRITE(10,1413)
      WRITE(*,1413)
1413  FORMAT(/' <<<<<The best combination of Tasks for this goal follows
     1>>>>>'/)
      IF(NTFO1.GT.0)GO TO 1415
```

```
      IF(IP.EQ.2)WRITE(10,412)
      WRITE(*,412)
      GO TO 1450
1415  IF(IP.EQ.2)WRITE(10,416)
      WRITE(*,416)
      DO 1430 I = 1,NTFO1
      M = TSKEFO(1,I)
      IF(IP.EQ.2)WRITE(10,420)NALT(1,M),NALT(2,M),DESC(M)
      WRITE(*,420)NALT(1,M),NALT(2,M), DESC(M)
1430  CONTINUE
      DO 1445 J = 1,5
      IF(KNUMO(1,J).EQ.0) GO TO 1445
      ACCUMO(1,4,J)=ACCUMO(1,4,J)/KNUMO(1,J)
      IF(IP.EQ.2)WRITE(10,440)GROUP(J), (ACCUMO(1,I,J),I=1,4)
      WRITE(*,440)GROUP(J), (ACCUMO(1,I,J),I=1,4)
      PAUSE ' *** Press ENTER to continue'
1445  CONTINUE
1450  IF(NTFO2.GT.0) GO TO 1515
      IF(IP.EQ.2)WRITE(10,512)
      WRITE(*,512)
      GO TO 1550
1515  IF(IP.EQ.2)WRITE(10,516)
      WRITE(*,516)
      DO 1530 I = 1,NTFO2
      M = TSKEFO(2,I)
      IF(IP.EQ.2)WRITE(10,420)NALT(1,M),NALT(2,M),DESC(M)
      WRITE(*,420)NALT(1,M),NALT(2,M),DESC(M)
1530  CONTINUE
      DO 1545 J=1,5
      IF(KNUMO(2,J).EQ.0)GO TO 1545
      ACCUMO(2,4,J)=ACCUMO(2,4,J)/KNUMO(2,J)
      IF(IP.EQ.2)WRITE(10,440)GROUP(J), (ACCUMO(2,I,J),I=1,4)
      WRITE(*,440)GROUP(J), (ACCUMO(2,I,J),I=1,4)
      PAUSE ' *** Press ENTER to continue'
1545  CONTINUE
C
C         CHECK IF MORE GOALS ARE TO BE EVALUATED
C
1550  IF(IP.EQ.2)WRITE(10,600)
      WRITE(*,600)
600   FORMAT(//5X,'Evaluation Complete.  New Goal? (Y/N):'\)
      ISTART=2
      READ(*,'(A)')YN
      IF(IP.EQ.2) WRITE(10,62) YN
      IF(YN.EQ.'Y'.OR.YN.EQ.'y') GO TO 120
```

```
C
C          SAVE GOAL DATA
C
      WRITE(13,20)MG,GOALS,KEYS
      STOP
      END
C
C           SUBROUTINE "RELAT"
C           CHECKS RELATIONSHIP WITH OTHER TASKS
C           PREVENTS DOUBLE COUNTING OF DELTA
C
      SUBROUTINE RELAT(KCODE,ITIME,N)
      INTEGER INFBY(3,10,4,100),NINF(3,100),LOCT(100)
      REAL MGY(3,7,100),CONF(3,7,100)
      COMMON DELTA,NTS,LOCT
      COMMON INFBY,MGY,CONF,NINF
      MAX = NINF(ITIME,N)
      IF(MAX.LE.0) RETURN
      DO 200 I = 1,MAX
      NIN = INFBY(ITIME,I,1,N)
      DO 50 J = 1,NTS
      IF (NIN.EQ.LOCT(J))GO TO 60
50    CONTINUE
      GO TO 200
60    DELTIN = MGY(ITIME,KCODE,NIN)
      IF(DELTIN.EQ.0.)GO TO 200
      IF(KCODE.EQ.1) GO TO 70
      IF(INFBY(ITIME,I,3,N).NE.KCODE) GO TO 200
70    IF(INFBY(ITIME,I,4,N).EQ.1) GO TO 90
      IF(INFBY(ITIME,I,4,N).EQ.2) GO TO 200
      IF(INFBY(ITIME,I,4,N).EQ.3) GO TO 150
      IF(INFBY(ITIME,I,4,N).EQ.4) GO TO 100
      GO TO 200
90    IF(DELTIN.GE.0.OR.DELTA.GE.0.) GO TO 200
      IF(DELTA.LE.DELTIN) DELTA = DELTA - DELTIN
      GO TO 200
100   IF(DELTIN.LT.0.) DELTA = DELTA - DELTIN
      GO TO 200
150   IF(DELTIN.GT.0.) DELTA = DELTA - DELTIN
200   CONTINUE
      RETURN
      END
```

C

APPENDIX C

Sample ZOWD Run Disk Output

```
    ZOWD PROGRAM OUTPUT FOR SESSION ON 25 Apr, 1991  AT 08:21
    OUTPUT FILE: AFB.TST


    Enter the INPUT FILE pathname (ZOWDIN2.DAT):
ZOWDIN2.DAT


    ****  GOAL SETTING PROCESS ****


    The following goals are available:

        1   Absolute Zero-Discharge
        2   Zero Waste Discharge
        3   BAT Treated Waste OK
        4   No point source discharge
        5   No ground water discharge
        6   No storm water discharge

Goals Seek to Maximize/Minimize Discharge Reduction as Follows:

      |---------------------- Objectives -----------------------
Goal  |   All      Waste      Point     Ground     Surface      Dom.
      | Water      Water    Sources     Water      Runoff     Waste

 1       MAX        ---        ---       ---        ---        ---
 2       ---        MAX        ---       ---        ---        ---
 3       ---        MIN        ---       ---        ---        ---
 4       ---        ---        MAX       ---        ---        ---
 5       ---        ---        ---       MAX        ---        ---
 6       ---        ---        ---       ---        MAX        ---

    ## Do you wish to change these, or add a goal? (Y/N)


    ## Select a Goal (A number from 1 to  6):
          2

    Please specify a time period for this goal.
```

```
          Choices are:
               1  =  Immediate (FY 1991/92)
               2  =  Short-term (Within next five years)
               3  =  Long term (Beyond five years)

     ## Enter Time Period (1 to 3):
           2
     Use Low Cost as an additional objective? (Y/N)
Y

     There are        27 possible alternative combinations.
     Would you like intermediate results written to disk? (Y/N)
Y


          *** PROCESSING BEGINS ***

     Processing Combination:     1

          Task 11; Alternative  0

          Task 21; Alternative  0


      **** Goal Selected is:  2  Zero Waste Discharge

     Actions which SUPPORT the objectives of this goal are:

      11  0  Process Water Reuse Potential Study
      21  0  Temporary Water Storage - New Off-Channel

  I.   Wastewater Recycle
     Total change in Offsite Water Discharge:      -74.0 MGY
     Minimum change with confidence factor:        -59.2 MGY
     Approximate Total Cost ($ millions):           1.67
     Average environmental impact code (0-10)       2.00


  II.  Storm Water
     Total change in Offsite Water Discharge:      -44.1 MGY
     Minimum change with confidence factor:        -22.0 MGY
     Approximate Total Cost ($ millions):          12.80
     Average environmental impact code (0-10)       6.00
```

```
Total All Groups
   Total change in Offsite Water Discharge:     -118.1 MGY
   Minimum change with confidence factor:        -81.3 MGY
   Approximate Total Cost ($ millions):          14.47
   Average environmental impact code (0-10)       4.00

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:      2

        Task 11; Alternative  0

        Task 21; Alternative  1


    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  0  Process Water Reuse Potential Study
    21  1  Temporary Water Storage - Great Western

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -74.0 MGY
   Minimum change with confidence factor:        -59.2 MGY
   Approximate Total Cost ($ millions):           1.67
   Average environmental impact code (0-10)       2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -80.7 MGY
   Minimum change with confidence factor:        -40.3 MGY
   Approximate Total Cost ($ millions):          91.10
   Average environmental impact code (0-10)       9.00


Total All Groups
   Total change in Offsite Water Discharge:     -154.7 MGY
   Minimum change with confidence factor:        -99.6 MGY
   Approximate Total Cost ($ millions):          92.77
   Average environmental impact code (0-10)       5.50

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.
```

```
Processing Combination:     3

     Task 11; Alternative  0

     Task 21; Alternative  2


 **** Goal Selected is:  2  Zero Waste Discharge

Actions which SUPPORT the objectives of this goal are:

 11  0  Process Water Reuse Potential Study
 21  2  Temporary Water Storage - Terminal Ponds

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:     -74.0 MGY
   Minimum change with confidence factor:       -59.2 MGY
   Approximate Total Cost ($ millions):          1.67
   Average environmental impact code (0-10)      2.00


II.  Storm Water
   Total change in Offsite Water Discharge:     -80.7 MGY
   Minimum change with confidence factor:       -40.3 MGY
   Approximate Total Cost ($ millions):         16.30
   Average environmental impact code (0-10)      8.00


Total All Groups
   Total change in Offsite Water Discharge:    -154.7 MGY
   Minimum change with confidence factor:       -99.6 MGY
   Approximate Total Cost ($ millions):         17.97
   Average environmental impact code (0-10)      5.00

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:     4

        Task 11; Alternative  0

        Task 21; Alternative  0
```

**** Goal Selected is: 2 Zero Waste Discharge

Actions which SUPPORT the objectives of this goal are:

11 0 Process Water Reuse Potential Study
21 0 Temporary Water Storage - New Off-Channel

I. Wastewater Recycle

Total change in Offsite Water Discharge:	-74.0 MGY
Minimum change with confidence factor:	-59.2 MGY
Approximate Total Cost ($ millions):	1.67
Average environmental impact code (0-10)	2.00

II. Storm Water

Total change in Offsite Water Discharge:	-44.1 MGY
Minimum change with confidence factor:	-22.0 MGY
Approximate Total Cost ($ millions):	12.80
Average environmental impact code (0-10)	6.00

Total All Groups

Total change in Offsite Water Discharge:	-118.1 MGY
Minimum change with confidence factor:	-81.3 MGY
Approximate Total Cost ($ millions):	14.47
Average environmental impact code (0-10)	4.00

*** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

Processing Combination: 5

Task 11; Alternative 0

Task 21; Alternative 1

**** Goal Selected is: 2 Zero Waste Discharge

Actions which SUPPORT the objectives of this goal are:

11 0 Process Water Reuse Potential Study
21 1 Temporary Water Storage - Great Western

I. Wastewater Recycle

```
   Total change in Offsite Water Discharge:      -74.0 MGY
   Minimum change with confidence factor:        -59.2 MGY
   Approximate Total Cost ($ millions):           1.67
   Average environmental impact code (0-10)       2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -80.7 MGY
   Minimum change with confidence factor:        -40.3 MGY
   Approximate Total Cost ($ millions):          91.10
   Average environmental impact code (0-10)       9.00


Total All Groups
   Total change in Offsite Water Discharge:     -154.7 MGY
   Minimum change with confidence factor:        -99.6 MGY
   Approximate Total Cost ($ millions):          92.77
   Average environmental impact code (0-10)       5.50

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:      6

        Task 11; Alternative  0

        Task 21; Alternative  2



    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  0  Process Water Reuse Potential Study
    21  2  Temporary Water Storage - Terminal Ponds

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -74.0 MGY
   Minimum change with confidence factor:        -59.2 MGY
   Approximate Total Cost ($ millions):           1.67
   Average environmental impact code (0-10)       2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -80.7 MGY
```

```
   Minimum change with confidence factor:       -40.3 MGY
   Approximate Total Cost ($ millions):          16.30
   Average environmental impact code (0-10)       8.00


Total All Groups
   Total change in Offsite Water Discharge:    -154.7 MGY
   Minimum change with confidence factor:       -99.6 MGY
   Approximate Total Cost ($ millions):          17.97
   Average environmental impact code (0-10)       5.00

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:     7

        Task 11; Alternative  0

        Task 21; Alternative  0


    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  0  Process Water Reuse Potential Study
    21  0  Temporary Water Storage - New Off-Channel

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:     -74.0 MGY
   Minimum change with confidence factor:       -59.2 MGY
   Approximate Total Cost ($ millions):           1.67
   Average environmental impact code (0-10)       2.00


II.  Storm Water
   Total change in Offsite Water Discharge:     -44.1 MGY
   Minimum change with confidence factor:       -22.0 MGY
   Approximate Total Cost ($ millions):          12.80
   Average environmental impact code (0-10)       6.00


Total All Groups
   Total change in Offsite Water Discharge:    -118.1 MGY
   Minimum change with confidence factor:       -81.3 MGY
```

```
   Approximate Total Cost ($ millions):          14.47
   Average environmental impact code (0-10)       4.00

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:      8

        Task 11; Alternative  0

        Task 21; Alternative  1


    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  0  Process Water Reuse Potential Study
    21  1  Temporary Water Storage - Great Western

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -74.0 MGY
   Minimum change with confidence factor:        -59.2 MGY
   Approximate Total Cost ($ millions):           1.67
   Average environmental impact code (0-10)       2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -80.7 MGY
   Minimum change with confidence factor:        -40.3 MGY
   Approximate Total Cost ($ millions):          91.10
   Average environmental impact code (0-10)       9.00


Total All Groups
   Total change in Offsite Water Discharge:     -154.7 MGY
   Minimum change with confidence factor:        -99.6 MGY
   Approximate Total Cost ($ millions):          92.77
   Average environmental impact code (0-10)       5.50

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:      9

        Task 11; Alternative  0
```

Task 21; Alternative 2

**** Goal Selected is: 2 Zero Waste Discharge

Actions which SUPPORT the objectives of this goal are:

11 0 Process Water Reuse Potential Study
21 2 Temporary Water Storage - Terminal Ponds

I. Wastewater Recycle

Total change in Offsite Water Discharge:	-74.0 MGY
Minimum change with confidence factor:	-59.2 MGY
Approximate Total Cost ($ millions):	1.67
Average environmental impact code (0-10)	2.00

II. Storm Water

Total change in Offsite Water Discharge:	-80.7 MGY
Minimum change with confidence factor:	-40.3 MGY
Approximate Total Cost ($ millions):	16.30
Average environmental impact code (0-10)	8.00

Total All Groups

Total change in Offsite Water Discharge:	-154.7 MGY
Minimum change with confidence factor:	-99.6 MGY
Approximate Total Cost ($ millions):	17.97
Average environmental impact code (0-10)	5.00

*** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

Processing Combination: 10

Task 11; Alternative 1

Task 21; Alternative 0

**** Goal Selected is: 2 Zero Waste Discharge

Actions which SUPPORT the objectives of this goal are:

```
    11  1  Task 11/13 Selected Alternate, Increase Capac.
    21  0  Temporary Water Storage - New Off-Channel

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -76.2 MGY
   Minimum change with confidence factor:        -61.0 MGY
   Approximate Total Cost ($ millions):           1.67
   Average environmental impact code (0-10)       2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -44.1 MGY
   Minimum change with confidence factor:        -22.0 MGY
   Approximate Total Cost ($ millions):          12.80
   Average environmental impact code (0-10)       6.00


Total All Groups
   Total change in Offsite Water Discharge:     -120.3 MGY
   Minimum change with confidence factor:        -83.0 MGY
   Approximate Total Cost ($ millions):          14.47
   Average environmental impact code (0-10)       4.00

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:    11

        Task 11; Alternative  1

        Task 21; Alternative  1


    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  1  Task 11/13 Selected Alternate, Increase Capac.
    21  1  Temporary Water Storage - Great Western

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -76.2 MGY
   Minimum change with confidence factor:        -61.0 MGY
   Approximate Total Cost ($ millions):           1.67
   Average environmental impact code (0-10)       2.00
```

```
II.  Storm Water
   Total change in Offsite Water Discharge:      -80.7 MGY
   Minimum change with confidence factor:        -40.3 MGY
   Approximate Total Cost ($ millions):           91.10
   Average environmental impact code (0-10)        9.00


Total All Groups
   Total change in Offsite Water Discharge:     -156.9 MGY
   Minimum change with confidence factor:       -101.3 MGY
   Approximate Total Cost ($ millions):           92.77
   Average environmental impact code (0-10)        5.50

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:    12

        Task 11; Alternative  1

        Task 21; Alternative  2


    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  1  Task 11/13 Selected Alternate, Increase Capac.
    21  2  Temporary Water Storage - Terminal Ponds

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -76.2 MGY
   Minimum change with confidence factor:        -61.0 MGY
   Approximate Total Cost ($ millions):            1.67
   Average environmental impact code (0-10)        2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -80.7 MGY
   Minimum change with confidence factor:        -40.3 MGY
   Approximate Total Cost ($ millions):           16.30
   Average environmental impact code (0-10)        8.00
```

```
Total All Groups
   Total change in Offsite Water Discharge:     -156.9 MGY
   Minimum change with confidence factor:       -101.3 MGY
   Approximate Total Cost ($ millions):          17.97
   Average environmental impact code (0-10)       5.00

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:    13

        Task 11; Alternative  1

        Task 21; Alternative  0


    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  1  Task 11/13 Selected Alternate, Increase Capac.
    21  0  Temporary Water Storage - New Off-Channel

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -76.2 MGY
   Minimum change with confidence factor:        -61.0 MGY
   Approximate Total Cost ($ millions):           1.67
   Average environmental impact code (0-10)       2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -44.1 MGY
   Minimum change with confidence factor:        -22.0 MGY
   Approximate Total Cost ($ millions):          12.80
   Average environmental impact code (0-10)       6.00


Total All Groups
   Total change in Offsite Water Discharge:     -120.3 MGY
   Minimum change with confidence factor:        -83.0 MGY
   Approximate Total Cost ($ millions):          14.47
   Average environmental impact code (0-10)       4.00

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.
```

```
   Processing Combination:    14

        Task 11; Alternative  1

        Task 21; Alternative  1


    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  1  Task 11/13 Selected Alternate, Increase Capac.
    21  1  Temporary Water Storage - Great Western

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -76.2 MGY
   Minimum change with confidence factor:        -61.0 MGY
   Approximate Total Cost ($ millions):           1.67
   Average environmental impact code (0-10)       2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -80.7 MGY
   Minimum change with confidence factor:        -40.3 MGY
   Approximate Total Cost ($ millions):          91.10
   Average environmental impact code (0-10)       9.00


Total All Groups
   Total change in Offsite Water Discharge:     -156.9 MGY
   Minimum change with confidence factor:       -101.3 MGY
   Approximate Total Cost ($ millions):          92.77
   Average environmental impact code (0-10)       5.50

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:    15

        Task 11; Alternative  1

        Task 21; Alternative  2
```

**** Goal Selected is: 2 Zero Waste Discharge

Actions which SUPPORT the objectives of this goal are:

11 1 Task 11/13 Selected Alternate, Increase Capac.
21 2 Temporary Water Storage - Terminal Ponds

I. Wastewater Recycle

Total change in Offsite Water Discharge:	-76.2 MGY
Minimum change with confidence factor:	-61.0 MGY
Approximate Total Cost ($ millions):	1.67
Average environmental impact code (0-10)	2.00

II. Storm Water

Total change in Offsite Water Discharge:	-80.7 MGY
Minimum change with confidence factor:	-40.3 MGY
Approximate Total Cost ($ millions):	16.30
Average environmental impact code (0-10)	8.00

Total All Groups

Total change in Offsite Water Discharge:	-156.9 MGY
Minimum change with confidence factor:	-101.3 MGY
Approximate Total Cost ($ millions):	17.97
Average environmental impact code (0-10)	5.00

*** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

Processing Combination: 16

Task 11; Alternative 1

Task 21; Alternative 0

**** Goal Selected is: 2 Zero Waste Discharge

Actions which SUPPORT the objectives of this goal are:

11 1 Task 11/13 Selected Alternate, Increase Capac.
21 0 Temporary Water Storage - New Off-Channel

I. Wastewater Recycle

```
   Total change in Offsite Water Discharge:      -76.2 MGY
   Minimum change with confidence factor:        -61.0 MGY
   Approximate Total Cost ($ millions):            1.67
   Average environmental impact code (0-10)        2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -44.1 MGY
   Minimum change with confidence factor:        -22.0 MGY
   Approximate Total Cost ($ millions):           12.80
   Average environmental impact code (0-10)        6.00


Total All Groups
   Total change in Offsite Water Discharge:     -120.3 MGY
   Minimum change with confidence factor:        -83.0 MGY
   Approximate Total Cost ($ millions):           14.47
   Average environmental impact code (0-10)        4.00

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:    17

        Task 11; Alternative  1

        Task 21; Alternative  1


    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  1  Task 11/13 Selected Alternate, Increase Capac.
    21  1  Temporary Water Storage - Great Western

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -76.2 MGY
   Minimum change with confidence factor:        -61.0 MGY
   Approximate Total Cost ($ millions):            1.67
   Average environmental impact code (0-10)        2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -80.7 MGY
```

```
   Minimum change with confidence factor:        -40.3 MGY
   Approximate Total Cost ($ millions):           91.10
   Average environmental impact code (0-10)        9.00


Total All Groups
   Total change in Offsite Water Discharge:     -156.9 MGY
   Minimum change with confidence factor:       -101.3 MGY
   Approximate Total Cost ($ millions):           92.77
   Average environmental impact code (0-10)        5.50

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:    18

        Task 11; Alternative  1

        Task 21; Alternative  2


    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  1  Task 11/13 Selected Alternate, Increase Capac.
    21  2  Temporary Water Storage - Terminal Ponds

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -76.2 MGY
   Minimum change with confidence factor:        -61.0 MGY
   Approximate Total Cost ($ millions):            1.67
   Average environmental impact code (0-10)        2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -80.7 MGY
   Minimum change with confidence factor:        -40.3 MGY
   Approximate Total Cost ($ millions):           16.30
   Average environmental impact code (0-10)        8.00


Total All Groups
   Total change in Offsite Water Discharge:     -156.9 MGY
   Minimum change with confidence factor:       -101.3 MGY
```

```
   Approximate Total Cost ($ millions):          17.97
   Average environmental impact code (0-10)       5.00

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:    19

        Task 11; Alternative  2

        Task 21; Alternative  0


    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  2  Task 11/13 Selected Alternate, Decreased Capac.
    21  0  Temporary Water Storage - New Off-Channel

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -63.8 MGY
   Minimum change with confidence factor:        -51.0 MGY
   Approximate Total Cost ($ millions):           1.67
   Average environmental impact code (0-10)       2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -44.1 MGY
   Minimum change with confidence factor:        -22.0 MGY
   Approximate Total Cost ($ millions):          12.80
   Average environmental impact code (0-10)       6.00


Total All Groups
   Total change in Offsite Water Discharge:     -107.9 MGY
   Minimum change with confidence factor:        -73.1 MGY
   Approximate Total Cost ($ millions):          14.47
   Average environmental impact code (0-10)       4.00

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:    20

        Task 11; Alternative  2
```

Task 21; Alternative 1

**** Goal Selected is: 2 Zero Waste Discharge

Actions which SUPPORT the objectives of this goal are:

11 2 Task 11/13 Selected Alternate, Decreased Capac.
21 1 Temporary Water Storage - Great Western

I. Wastewater Recycle

Total change in Offsite Water Discharge:	-63.8 MGY
Minimum change with confidence factor:	-51.0 MGY
Approximate Total Cost ($ millions):	1.67
Average environmental impact code (0-10)	2.00

II. Storm Water

Total change in Offsite Water Discharge:	-80.7 MGY
Minimum change with confidence factor:	-40.3 MGY
Approximate Total Cost ($ millions):	91.10
Average environmental impact code (0-10)	9.00

Total All Groups

Total change in Offsite Water Discharge:	-144.5 MGY
Minimum change with confidence factor:	-91.4 MGY
Approximate Total Cost ($ millions):	92.77
Average environmental impact code (0-10)	5.50

*** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

Processing Combination: 21

Task 11; Alternative 2

Task 21; Alternative 2

**** Goal Selected is: 2 Zero Waste Discharge

Actions which SUPPORT the objectives of this goal are:

```
    11  2  Task 11/13 Selected Alternate, Decreased Capac.
    21  2  Temporary Water Storage - Terminal Ponds

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -63.8 MGY
   Minimum change with confidence factor:        -51.0 MGY
   Approximate Total Cost ($ millions):           1.67
   Average environmental impact code (0-10)       2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -80.7 MGY
   Minimum change with confidence factor:        -40.3 MGY
   Approximate Total Cost ($ millions):          16.30
   Average environmental impact code (0-10)       8.00


Total All Groups
   Total change in Offsite Water Discharge:     -144.5 MGY
   Minimum change with confidence factor:        -91.4 MGY
   Approximate Total Cost ($ millions):          17.97
   Average environmental impact code (0-10)       5.00

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:    22

        Task 11; Alternative  2

        Task 21; Alternative  0



    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  2  Task 11/13 Selected Alternate, Decreased Capac.
    21  0  Temporary Water Storage - New Off-Channel

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -63.8 MGY
   Minimum change with confidence factor:        -51.0 MGY
   Approximate Total Cost ($ millions):           1.67
   Average environmental impact code (0-10)       2.00
```

```
II.  Storm Water
   Total change in Offsite Water Discharge:      -44.1 MGY
   Minimum change with confidence factor:        -22.0 MGY
   Approximate Total Cost ($ millions):          12.80
   Average environmental impact code (0-10)       6.00


Total All Groups
   Total change in Offsite Water Discharge:     -107.9 MGY
   Minimum change with confidence factor:        -73.1 MGY
   Approximate Total Cost ($ millions):          14.47
   Average environmental impact code (0-10)       4.00

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:    23

        Task 11; Alternative  2

        Task 21; Alternative  1


    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  2  Task 11/13 Selected Alternate, Decreased Capac.
    21  1  Temporary Water Storage - Great Western

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -63.8 MGY
   Minimum change with confidence factor:        -51.0 MGY
   Approximate Total Cost ($ millions):           1.67
   Average environmental impact code (0-10)       2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -80.7 MGY
   Minimum change with confidence factor:        -40.3 MGY
   Approximate Total Cost ($ millions):          91.10
   Average environmental impact code (0-10)       9.00
```

Total All Groups

Total change in Offsite Water Discharge:	-144.5 MGY
Minimum change with confidence factor:	-91.4 MGY
Approximate Total Cost ($ millions):	92.77
Average environmental impact code (0-10)	5.50

*** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

Processing Combination: 24

Task 11; Alternative 2

Task 21; Alternative 2

**** Goal Selected is: 2 Zero Waste Discharge

Actions which SUPPORT the objectives of this goal are:

11	2	Task 11/13 Selected Alternate, Decreased Capac.
21	2	Temporary Water Storage - Terminal Ponds

I. Wastewater Recycle

Total change in Offsite Water Discharge:	-63.8 MGY
Minimum change with confidence factor:	-51.0 MGY
Approximate Total Cost ($ millions):	1.67
Average environmental impact code (0-10)	2.00

II. Storm Water

Total change in Offsite Water Discharge:	-80.7 MGY
Minimum change with confidence factor:	-40.3 MGY
Approximate Total Cost ($ millions):	16.30
Average environmental impact code (0-10)	8.00

Total All Groups

Total change in Offsite Water Discharge:	-144.5 MGY
Minimum change with confidence factor:	-91.4 MGY
Approximate Total Cost ($ millions):	17.97
Average environmental impact code (0-10)	5.00

*** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

```
   Processing Combination:    25

        Task 11; Alternative  2

        Task 21; Alternative  0


    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  2  Task 11/13 Selected Alternate, Decreased Capac.
    21  0  Temporary Water Storage - New Off-Channel

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:     -63.8 MGY
   Minimum change with confidence factor:       -51.0 MGY
   Approximate Total Cost ($ millions):          1.67
   Average environmental impact code (0-10)      2.00


II.  Storm Water
   Total change in Offsite Water Discharge:     -44.1 MGY
   Minimum change with confidence factor:       -22.0 MGY
   Approximate Total Cost ($ millions):         12.80
   Average environmental impact code (0-10)      6.00


Total All Groups
   Total change in Offsite Water Discharge:    -107.9 MGY
   Minimum change with confidence factor:       -73.1 MGY
   Approximate Total Cost ($ millions):         14.47
   Average environmental impact code (0-10)      4.00

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

   Processing Combination:    26

        Task 11; Alternative  2

        Task 21; Alternative  1
```

**** Goal Selected is: 2 Zero Waste Discharge

Actions which SUPPORT the objectives of this goal are:

11 2 Task 11/13 Selected Alternate, Decreased Capac.
21 1 Temporary Water Storage - Great Western

I. Wastewater Recycle

Total change in Offsite Water Discharge:	-63.8 MGY
Minimum change with confidence factor:	-51.0 MGY
Approximate Total Cost ($ millions):	1.67
Average environmental impact code (0-10)	2.00

II. Storm Water

Total change in Offsite Water Discharge:	-80.7 MGY
Minimum change with confidence factor:	-40.3 MGY
Approximate Total Cost ($ millions):	91.10
Average environmental impact code (0-10)	9.00

Total All Groups

Total change in Offsite Water Discharge:	-144.5 MGY
Minimum change with confidence factor:	-91.4 MGY
Approximate Total Cost ($ millions):	92.77
Average environmental impact code (0-10)	5.50

*** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.

Processing Combination: 27

Task 11; Alternative 2

Task 21; Alternative 2

**** Goal Selected is: 2 Zero Waste Discharge

Actions which SUPPORT the objectives of this goal are:

11 2 Task 11/13 Selected Alternate, Decreased Capac.
21 2 Temporary Water Storage - Terminal Ponds

I. Wastewater Recycle

```
   Total change in Offsite Water Discharge:      -63.8 MGY
   Minimum change with confidence factor:        -51.0 MGY
   Approximate Total Cost ($ millions):            1.67
   Average environmental impact code (0-10)        2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -80.7 MGY
   Minimum change with confidence factor:        -40.3 MGY
   Approximate Total Cost ($ millions):           16.30
   Average environmental impact code (0-10)        8.00


Total All Groups
   Total change in Offsite Water Discharge:     -144.5 MGY
   Minimum change with confidence factor:        -91.4 MGY
   Approximate Total Cost ($ millions):           17.97
   Average environmental impact code (0-10)        5.00

   *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.



    **** Goal Selected is:  2  Zero Waste Discharge

   Actions which SUPPORT the objectives of this goal are:

    11  1  Task 11/13 Selected Alternate, Increase Capac.
    21  2  Temporary Water Storage - Terminal Ponds

I.   Wastewater Recycle
   Total change in Offsite Water Discharge:      -76.2 MGY
   Minimum change with confidence factor:        -61.0 MGY
   Approximate Total Cost ($ millions):            1.67
   Average environmental impact code (0-10)        2.00


II.  Storm Water
   Total change in Offsite Water Discharge:      -80.7 MGY
   Minimum change with confidence factor:        -40.3 MGY
   Approximate Total Cost ($ millions):           16.30
   Average environmental impact code (0-10)        8.00
```

```
  Total All Groups
     Total change in Offsite Water Discharge:     -156.9 MGY
     Minimum change with confidence factor:       -101.3 MGY
     Approximate Total Cost ($ millions):          17.97
     Average environmental impact code (0-10)       5.00

     *** NO ACTIONS FOUND WHICH OPPOSE THIS GOAL.


     Evaluation Complete.  New Goal? (Y/N):
N
```

D

APPENDIX D

ZOWD/COMB User's Manual

This Appendix contains information needed for the efficient use of the ZOWD model. It assumes that the user has a basic understanding of DOS machines, as well as dBase III+.

The model is meant to be used with information derived from the other subordinate tasks of the Zero-Offsite Water Discharge Study, but any plans affecting water at the Rocky Flats Plant can be included in the data base. The information required from the subordinate studies (named "Tasks") is described in Section 3.3 of this report. The data are entered and maintained in a dBase file which is used as input for the ZOWD programs. The COMB program is used to determine the possible alternative combinations to be evaluated in ZOWD. The ZOWD program is described in Section 4.1 of this report, and it includes a goal-setting stage followed by analysis of the combinations of alternatives to select an optimal set of task alternatives for implementation. The process can be summarized as follows:

- Enter basic Task information into a dBase III+ file called the Task Input File. Each Task can have one or more "Task/alternatives" which represent different approaches to solving the problem at hand.

- Edit the file periodically as necessary to include new or changed information.

- Run program COMB to determine the possible sets of relevant combinations of Task/alternatives which are to be analyzed in program ZOWD.

- Run program ZOWD. This interactive program requests the user to select from a list (or provide) a basic goal and several objectives to be evaluated. The program tests the data in the Task Input File against these objectives and selects an optimal combination of Tasks to be implemented.

- Re-run ZOWD as often as necessary to test different objective-sets.

Detailed instructions for performing these tasks follow.

D.1 Building/editing the database file

Before the COMB and ZOWD programs can be used, a dBase III+ file containing the information described in Section 3.3 of this report must be created. The following steps can be used to create and/or edit that file:

1. Enter DBASE 3+ and the HELP Screen.

2. "**Organize**", "**Copy**", to create a Backup DBASE file before beginning to enter or edit data. Keep the working copy of the file named **ZOWDTAS2.DBF** in order to use the customized screen for appending and editing (**ZOWDTASK.FMT**).

3. "**Esc**" to leave the HELP Screen.

   - at "." prompt, type **SET**.
   - under "**Options**", highlight "**Bell**", and hit return to set off.
   - "**Esc**" to return to the HELP Screen.

4. Highlight "**Setup**", "**Database File**", enter.

   - go to location of DBASE File, eg. C:\DBASE\ZOWDTAS2.DBF
   - indexed, "**No**"
   - file is now loaded and ready for use.

5. Highlight "**Setup**", "**Format for Screen**", enter.

   - go to location of customized input screen, eg. C:\DBASE\ZOWDFORM.FMT

As stated above, the custom screen ZOWDFORM.FMT only works with an input file named ZOWDTAS2.DBF. It is necessary to use this name for the working file in order to use the custom screen or replicate the custom screen again for the name of the working file you are using.

6. Go to "**Update**"

   - "**Append**" to add new records at bottom of file. (Must re-sort the file in order to place in another location within file.)

   - "**Edit**" to modify record. (It is usually helpful to "**Point**" to the area of the file where you wish to work prior to entering "**Edit**" as it takes a long time to Scroll long distances in "**Edit**" mode. ****Very Important*** Use "**Ctrl End**" when

finished with the "Edit" mode to Save the changes made. "Esc" at the end of the changes will not save any of the editing.

- "**Display**" to view file.

- "**Browse**" to scroll and edit file, not in customized screen.

Other useful commands within the edit mode are as follows:

- "**Replace**" for global replacements of individual files. (Select fields, scope of the replacement, and execute.)

- "**Delete**" to mark records for deletion.

- "**Recall**" to restore specified records marked for deletion.

- "**Pack**" to permanently erase records marked for deletion.

7. "**Position**" to quickly move in file.

8. After all editing, additions, etc., are complete, then:

   - "**Organize**", "**Sort**" on TASK, ALT, and TIME to organize **ZOWDTAS2.DBF** for input into ZOWD Model. (It may be a good idea to save to another name, exit and rename the working copy with a backup name, and then rename the sorted set as ZOWDTAS2.DBF)

   - "**Esc**" to leave the HELP Screen.

   - At "." Prompt, type **COPY TO** <Filename> **TYPE SDF**, return.
     eg.- . COPY TO C:\RFPASI\ZOWDTAS2.SDF TYPE SDF

9. File created (eg.- C:\RFPASI\ZOWDTAS2.SDF) is then an ASCII text file which can be read by the ZOWD program. In addition, using file, it can replace the data in C:\RFPASI\ZOWDTAS2.WP5 for printing out a complete listing of the data set.

D.2 Program COMB

Program COMB creates a disk file of Task/alternative combinations to be used by ZOWD. To run COMB, follow these steps:

1. It is normally preferable to change to the directory containing the Task 23 database files and programs.

2. Type **CLS**

3. Type **COMBY**. The program is interactive. It will request the names of input and output files. Simply hit **Enter** if the default files ZOWDCOMB.DAT and ZOWDIN2.DAT are required.

D.3 Program ZOWD

Program ZOWD evaluates combinations of Task/alternatives according to the requirements of goals and objectives defined by the user. The program cannot be run unless the dBase input file and combinations file have been created previously as described in sections D.1 and D.2. The ZOWD program is interactive. To run, follow these steps:

1. At the DOS prompt, type **ZOWD.**

2. The first question asked is: "Use Default Goal Data?". This refers to an initial set of goals and objectives built into ZOWD. When running ZOWD for the first time, you must type **Y**, since otherwise the program will search for a file named ZOWDSYST which contains a customized set of goals and objectives. This file is written at the end of each ZOWD run. A customized set of goals and objectives can be achieved by answering **Y** when the program asks "Do you wish to change these, or add a goal?". This customized goal set will be saved automatically in file ZOWDSYST.

E

APPENDIX E

ZOWD DBASE INPUT FILE

Structure for database: C:\RFPASI\ZOWDTAS2.SDF
Number of data records: 108
Date of last update : 4/23/91

TASK	A L T	NAME	TIME	D / A E	T / R	MGY	%	MGY	%	MGY	%	MGY	%	MGY	%	MGY	%	MGY	%	MIL	E	INFLUENCING TASKS
1	O	Sanitary Sewer	NOWD		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
1	O	Sanitary Sewer	5YR	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
1	O	Sanitary Sewer	LT	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
2	O	Storm Sewer Infiltration/Inflow and Exfiltration	NOWD		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
2	O	Storm Sewer Infiltration/Inflow and Exfiltration	5YR	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
2	O	Storm Sewer Infiltration/Inflow and Exfiltration	LT	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
3	O	Non-Point Source Assessment	NOWD		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
3	O	Non-Point Source Assessment	5YR	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
3	O	Non-Point Source Assessment	LT	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
4	O	Water Yield/Quality; Walnut, Woman Watersheds	NOWD		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
4	O	Water Yield/Quality; Walnut, Woman Watersheds	5YR	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
4	O	Water Yield/Quality; Walnut, Woman Watersheds	LT	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
5	O	Rainfall/Runoff Relationships	NOWD		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
5	O	Rainfall/Runoff Relationships	5YR	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
5	O	Rainfall/Runoff Relationships	LT	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
6	O	Storm runoff quantities for various design events	NOWD		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
6	O	Storm runoff quantities for various design events	5YR	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
6	O	Storm runoff quantities for various design events	LT	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
7	O	Solar Pond Interceptor Trench; GW Management Study	NOWA		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	12 04A 0 000 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
7	O	Solar Pond Interceptor Trench; GW Management Study	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	12 04A 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
7	O	Solar Pond Interceptor Trench; GW Management Study	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	12 04A 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
8	O	Present Landfill Area GW/Surf. Water Collection	NOWA		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	15 04A 15 05A 21 04A 21 05A 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
8	O	Present Landfill Area GW/Surf. Water Collection	5YR	A	T	3.7	80	0.0	0	0.0	0	-1.7	80	5.4	80	0.0	0	0.0	0	0.00	0	15 04A 15 05A 21 04A 21 05A 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
8	O	Present Landfill Area GW/Surf. Water Collection	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	15 04A 15 05A 21 04A 21 05A 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
9	O	Design Recurrence Intervals Study	NOWD		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
9	O	Design Recurrence Intervals Study	5YR	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
9	O	Design Recurrence Intervals Study	LT	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
10	O	Sanitary Treatment Plant Evaluation Study	NOWA		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
10	O	Sanitary Treatment Plant Evaluation Study	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
10	O	Sanitary Treatment Plant Evaluation Study	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
11	O	Process Water Reuse Potential Study	NOWA		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	8 06D 15 01A 18 04D 19 16D 19 06D 0 00B 0 00B 0 00B 0 00B 0 00B

TASK	ALT	NAME	TIME	DIM	DAR	MGY	%	MGY	%	MGY	%	MGY	%	MGY	%	MGY	%	MGY	%	MIL	E	INFLUENCING TASKS
11	0	Process Water Reuse Potential Study	5YR	A	T	-74.0	80	-74.0	80	-74.0	80	0.0	0	0.0	0	-74.0	80	0.0	0	1.67	2	8 06D 15 01A 18 04D 19 16C 19 06D 0 00B 0 00B 0 00B 0 00B 0 00B
11	0	Process Water Reuse Potential Study	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	8 06D 15 01A 18 04D 19 16C 19 06D 0 00B 0 00B 0 00B 0 00B 0 00B
11	1	Task 11/13 Selected Alternate, Increase Capac.	NOWA		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	8 06D 15 01A 18 04D 19 16C 19 06D 19 06C 0 00B 0 00B 0 00B 0 00B
11	1	Task 11/13 Selected Alternative, Increase Capac.	5YR	A	T	-76.2	80	-76.2	80	-76.2	80	0.0	0	0.0	0	-76.2	80	0.0	0	1.67	2	8 06D 15 01C 18 04D 19 16C 19 06D 19 06C 0 00B 0 00B 0 00B 0 00B
11	1	Task 11/13 Selected Alternate, Increase Capac.	LT	A	T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	8 06D 15 01A 18 04D 19 16C 19 06D 19 06C 0 00B 0 00B 0 00B 0 00B
11	2	Task 11/13 Selected Alternate, Decreased Capac.	NOWA		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	8 06D 15 01A 18 04D 19 16C 19 06D 19 06C 0 00B 0 00B 0 00B 0 00B
11	2	Task 11/13 Selected Alternate, Reduced Capacity	5YR	A	T	-63.8	80	-63.8	80	-63.8	80	0.0	0	0.0	0	-63.8	80	0.0	0	1.67	2	8 06D 15 01A 18 04D 19 16C 19 06D 19 06C 0 00B 0 00B 0 00B 0 00B
11	2	Task 11/13 Selected Alternate, Decrease Capac.	LT	A	T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	8 06D 15 01A 18 04D 19 16C 19 06D 19 06C 0 00B 0 00B 0 00B 0 00B
12	0	Reverse Osmosis and Mechanical Evaporation Study	NOWA		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
12	0	Reverse Osmosis and Mechanical Evaporation Study	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
12	0	Reverse Osmosis and Mechanical Evaporation Study	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
13	0	Treated Sewage/Process Wastewater Recycle Study	NOWA		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
13	0	Treated Sewage/Process Wastewater Recycle Study	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
13	0	Treated Sewage/Process Wastewater Recycle Study	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
14	0	Surface-Water and Groundwater Rights Study	NOWD		T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
14	0	Surface-Water and Groundwater Rights Study	5YR	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
14	0	Surface-Water and Groundwater Rights Study	LT	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
15	0	Surface-Water Evaporation Study	NOWA		T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	11 01A 12 01A 13 01A 21 01A 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
15	0	Surface-Water Evaporation Study	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	11 01A 12 01A 13 01A 21 01A 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
15	0	Surface-Water Evaporation Study	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	11 01A 12 01A 13 01A 21 01A 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
16	0	Water Yield/Quality other trib. sources to Lakes	NOWD		T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
16	0	Water Yield/Quality other trib. sources to Lakes	5YR	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
16	0	Water Yield/Quality other trib. sources to Lakes	LT	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
17	0	Alternatives to Zero-Discharge	NOWA		T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
17	0	Alternatives to Zero-Discharge	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
17	0	Alternatives to Zero-Discharge	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
18	0	Drain Study	NOWA		T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
18	0	Drain Study	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
18	0	Drain Study	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
19	0	Waste Minimization Study	NOWA		T	0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	1	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
19	0	Waste Minimization Study	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	-7.9	75	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
19	0	Waste Minimization Study	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
19	1	Task 19 With Increased Load to STP	NOWA		T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000

TASK	ALT	NAME	TIME	D/A	T/R	MGY	%	MGY	%	MGY	%	MGY	%	MGY	%	MGY	%	MIL	E	INFLUENCING TASKS
19	1	Task with Increased Load to STP	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	2.3	75	0.0	0	0.00 0 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000
19	1	Task 19 with Increased Load to STP	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000
19	2	Task 19 with Decreased Load to STP	NOWA	T		0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000
19	2	Task 19 with Decreased Load to STP	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	-10.2	75	0.0	0	0.00 0 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000
19	2	Task 19 With Decreased Load to STP	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000
20	0	Domestic and Process Water Pipeline Leak Study	NOWA	T		0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
20	0	Domestic and Process Water Pipeline Leak Study	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
20	0	Domestic and Process Water Pipeline Leak Study	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
21	0	Temporary Water Storage - New Off-Channel	NOWA	T		0.0	100	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
21	0	Temporary Water Storage - New Off Channel	5YR	A	T	-121.5	50	-44.1	50	0.0	0	-3.3	50	-40.8	50	-77.4	50	0.0	0	12.80 6 11 06A 8 04A 11 16A 11 26A 26 04A 15 01A 0 00B 0 00B 0 00B 0 00B
21	0	Temporary Water Storage - New Off-Channel	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
21	1	Temporary Water Storage - Great Western	NOWA	T		0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000
21	1	Temporary Water Storage - Great Western	5YR	A	T	-126.3	50	-80.7	50	0.0	0	-3.3	50	-45.6	50	-77.4	50	0.0	0	91.10 9 11 06A 8 04A 11 16A 11 26A 26 04A 15 01A 0 000 0 000 0 000 0 000
21	1	Temporary Water Storage - Great Western	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000
21	2	Temporary Water Storage - Terminal Ponds	NOWA	T		0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000
21	2	Temporary Water Storage - Terminal Ponds	5YR	A	T	-121.5	50	-80.7	50	0.0	0	-3.3	50	-40.8	50	-77.4	50	0.0	0	16.30 8 11 06A 8 04A 11 16A 11 24A 26 04A 15 01A 0 000 0 000 0 000 0 000
21	2	Temporary Water Storage - Terminal Ponds	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000
22	0	Groundwater Recharge Study	NOWA	T		0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
22	0	Groundwater Recharge Study	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
22	0	Groundwater Recharge Study	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
23	0	Water Resources Management Study	NOWD	T		0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
23	0	Water Resources Management Study	5YR	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
23	0	Water Resources Management Study	LT	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
24	0	Bypass Upstream Flows Around Rocky Flats Plant	NOWA	T		0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
24	0	Bypass Upstream Flows Around Rocky Flats Plant	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
24	0	Bypass Upstream Flows Around Rocky Flats Plant	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
25	0	Study of Downstream Erosion Potential	NOWD	T		0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
25	0	Study of Downstream Erosion Potential	5YR	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
25	0	Study of Downstream Erosion Potential	LT	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
26	0	Feasibility of Groundwater Cutoff/Diversion	NOWA	T		0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
26	0	Feasibility of Groundwater Cutoff/Diversion	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
26	0	Feasibility of Groundwater Cutoff/Diversion	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
27	0	Waste Generation Treatment Study	NOWA	T		0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00 0 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B

TASK	A L T	NAME	TIME	D / M	T A E	MGY	%	MGY	%	MGY	%	MGY	%	MGY	%	MGY	%	MGY	%	MIL	E	INFLUENCING TASKS
27	0	Waste Generation Treatment Study	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
27	0	Waste Generation Treatment Study	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
28	0	Augmentation Plan for the Rocky Flats Plant	NOW	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
28	0	Augmentation Plan for the Rocky Flats Plant	5YR	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
28	0	Augmentation Plan for the Rocky Flats Plant	LT	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
29	0	Non-tributary Groundwater Study	NOW	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
29	0	Non-tributary Groundwater Study	5YR	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
29	0	Non-tributary Groundwater Study	LT	D	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
30	0	Consolidation and Zero-Discharge Plan	NOW	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
30	0	Consolidation and Zero-Discharge Plan	5YR	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B
30	0	Consolidation and Zero-Discharge Plan	LT	A	T	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.00	0	0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B 0 00B

F

APPENDIX F

WATER MANAGEMENT SUMMARY

DATA INPUT FORMS

Table F-1

Water Management Summary for Task 1: Sanitary Sewer Infiltration/Inflow and Exfiltration Study

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Data**		--		--	
2. Technical vs. Polit./Regulatory	**Technical**		--		--	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	0	100				
3.2 Total Wastewater	--					
3.3 Point-source discharges	--					
3.4 Sources to groundwater	--					
3.5 Surface runoff	--					
3.6 Domestic waste	--					
3.7 Misc. losses	--					
4. Financial Impact	0					
5. Environmental Impact	0					
6. Input from/to Other Tasks (enumerate):	30					
7. Input from WR Plan	--					
8. Input from Monitoring	**ASI, EMAD**					

Table F-1 (Continued)

Water Management Summary for Task 1: Sanitary Sewer Infiltration/Inflow and Exfiltration Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-2

Water Management Summary for Tasks 2, 3: Non-point Source Assessment and Storm-Sewer Infiltration/Inflow and Exfiltration Study

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Data**		--		--	
2. Technical vs. Polit./Regulatory	**Technical**		--		--	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	0	**100**				
3.2 Total Wastewater	--					
3.3 Point-source discharges	--					
3.4 Sources to groundwater	--					
3.5 Surface runoff	--					
3.6 Domestic waste	--					
3.7 Misc. losses	--					
4. Financial Impact	0					
5. Environmental Impact	0					
6. Input from/to Other Tasks (enumerate):	**4,5,13,16, 24,30**					
7. Input from WR Plan	--					
8. Input from Monitoring	**ASI, EMAD**					

Table F-2 (continued)

Water Management Summary for Tasks 2, 3: Non-point Source Assessment and Storm-Sewer Infiltration/Inflow and Exfiltration Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-3

Water Management Summary for Task 4: Water-Yield and Water-Quality Study of Walnut Creek and Woman Creek Watersheds

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Data**		--		--	
2. Technical vs. Polit./Regulatory	**Technical**		--		--	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	0	100				
3.2 Total Wastewater	--					
3.3 Point-source discharges	--					
3.4 Sources to groundwater	--					
3.5 Surface runoff	--					
3.6 Domestic waste	--					
3.7 Misc. losses	--					
4. Financial Impact	0					
5. Environmental Impact	0					
6. Input from/to Other Tasks (enumerate):	**14,28,30**					
7. Input from WR Plan	--					
8. Input from Monitoring	**ASI**					

Table F-3 (continued)

Water Management Summary for Task 4: Water-Yield and Water-Quality Study of Walnut Creek and Woman Creek Watersheds

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-4

Water Management Summary for Task 5: Confirmation of Rainfall/Runoff Relationships Study

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Data**		--		--	
2. Technical vs. Polit./Regulatory	**Technical**		--		--	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	0	100				
3.2 Total Wastewater	--					
3.3 Point-source discharges	--					
3.4 Sources to groundwater	--					
3.5 Surface runoff	--					
3.6 Domestic waste	--					
3.7 Misc. losses	--					
4. Financial Impact	0					
5. Environmental Impact	0					
6. Input from/to Other Tasks (enumerate):	30					
7. Input from WR Plan	--					
8. Input from Monitoring	**ASI**					

Table F-4 (continued)

Water Management Summary for Task 5: Confirmation of Rainfall/Runoff Relationships Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-5

Water Management Summary for Task 6: Storm Runoff Quantity for Various Design Events Study

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Data**		--		--	
2. Technical vs. Polit./Regulatory	**Technical**		--		--	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	0	100				
3.2 Total Wastewater	--					
3.3 Point-source discharges	--					
3.4 Sources to groundwater	--					
3.5 Surface runoff	--					
3.6 Domestic waste	--					
3.7 Misc. losses	--					
4. Financial Impact	0					
5. Environmental Impact	0					
6. Input from/to Other Tasks (enumerate):	30					
7. Input from WR Plan	--					
8. Input from Monitoring	--					

Table F-5 (continued)

Water Management Summary for Task 6: Storm Runoff Quantity for Various Design Events Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-6

Water Management Summary for Task 7: Solar Pond Interceptor Trench System Ground-Water Management Study

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Action**		--		--	
2. Technical vs. Polit./Regulatory	**Technical**		--		--	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	0	100				
3.2 Total Wastewater	--					
3.3 Point-source discharges	--					
3.4 Sources to groundwater	--					
3.5 Surface runoff	--					
3.6 Domestic waste	--					
3.7 Misc. losses	--					
4. Financial Impact	0					
5. Environmental Impact	0					
6. Input from/to Other Tasks (enumerate):	30					
7. Input from WR Plan	--					
8. Input from Monitoring	--					

Table F-6 (continued)

Water Management Summary for Task 7:
Solar Pond Interceptor Trench System Ground-Water Management Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
12	4	A	

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-7

Water Management Summary for Task 8: Present Landfill Area Groundwater/Surface Water Collection Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Action**		**Action**		**Action**	
2.	Technical vs. Polit./Regulatory	**Technical**		**Regulatory**		**Regulatory**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	+3.7	80	+3.7	80
	3.2 Total Wastewater	--					
	3.3 Point-source discharges	--					
	3.4 Sources to groundwater	--		-1.7	80	-1.7	80
	3.5 Surface runoff	--		+5.4	80	+5.4	80
	3.6 Domestic waste	--		--		--	
	3.7 Misc. losses	--		--		--	
4.	Financial Impact	0		?		?	
5.	Environmental Impact	0		2		2	
6.	Input from/to Other Tasks (enumerate):	10,11,12, 13,14,26, 27,28,30		**same**		**same**	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	**EMAD**		**EMAD**		**EMAD**	

Table F-7 (continued)

Water Management Summary for Task 8:
Present Landfill Area Groundwater/Surface Water Collection Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
15	4,5	A	
21	4,5	A	

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-8

Water Management Summary for Task 9: Design Recurrence Intervals Study

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Data**		--		--	
2. Technical vs. Polit./Regulatory	**Technical**		--		--	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	0	100				
3.2 Total Wastewater	--					
3.3 Point-source discharges	--					
3.4 Sources to groundwater	--					
3.5 Surface runoff	--					
3.6 Domestic waste	--					
3.7 Misc. losses	--					
4. Financial Impact	0					
5. Environmental Impact	0					
6. Input from/to Other Tasks (enumerate):	6,30					
7. Input from WR Plan	--					
8. Input from Monitoring	--					

Table F-8 (continued)

Water Management Summary for Task 9: Design Recurrence Intervals Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-9

Water Management Summary for Task 10: Sanitary Treatment Plant Evaluation Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Action**		**Action**		**Action**	
2.	Technical vs. Polit./Regulatory	**Technical**		**Technical**		**Technical**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	0	100	0	100
	3.2 Total Wastewater	--		--		--	
	3.3 Point-source discharges	--		--		--	
	3.4 Sources to groundwater	--		--		--	
	3.5 Surface runoff	--		--		--	
	3.6 Domestic waste	--		--		--	
	3.7 Misc. losses	--		--		--	
4.	Financial Impact	0		$2.6 M		?	
5.	Environmental Impact	0		0		0	
6.	Input from/to Other Tasks (enumerate):	11,12,13, 30		same		same	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	EMAD,CDH, ASI		EMAD,CDH		EMAD,CDH	

Table F-9 (continued)

Water Management Summary for Task 10: Sanitary Treatment Plant Evaluation Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-10

Water Management Summary for Tasks 11/13 (Alternative 0): Treated Sewage/Process Wastewater Recycle and Reuse Study

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Data**		**Action**		**Action**	
2. Technical vs. Polit./Regulatory	**Technical**		**Technical**		**Technical**	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	0	100	-74	80	?	
3.2 Total Wastewater	--		-74	80		
3.3 Point-source discharges	--		-74	80		
3.4 Sources to groundwater	--		0			
3.5 Surface runoff	--		0			
3.6 Domestic waste	--		-74	80		
3.7 Misc. losses	--		0			
4. Financial Impact	0		$1.67 M		?	
5. Environmental Impact	0		2		2	
6. Input from/to Other Tasks (enumerate):	10,12,30		10,12,30		10,12,30	
7. Input from WR Plan	--		--		--	
8. Input from Monitoring	--		--		--	

Table F-10 (continued)

Water Management Summary for Tasks 11/13 (Alternative 0): Treated Sewage/Process Wastewater Recycle and Reuse Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
8	1,2,3,6	D	**STP Alternate**
15	1-7	A	
18	4	D	

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-10 (continued)

Water Management Summary for Tasks 11/13 (Alternative 1): Treated Sewage/Process Wastewater Recycle and Reuse Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
8	1,2,3,6	D	STP Alternate
15	1-7	A	
18	4	D	
19	6	C	
19	6	D	

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-10 (continued)

Water Management Summary for Tasks 11/13 (Alternative 2): Treated Sewage/Process Wastewater Recycle and Reuse Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Data**		**Action**		**Action**	
2.	Technical vs. Polit./Regulatory	**Technical**		**Technical**		**Technical**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	-63.8	80	?	
	3.2 Total Wastewater	--		-63.8	80		
	3.3 Point-source discharges	--		-63.8	80		
	3.4 Sources to groundwater	--		0			
	3.5 Surface runoff	--		0			
	3.6 Domestic waste	--		-63.8	80		
	3.7 Misc. losses	--		0			
4.	Financial Impact	0		$1.67 M ?		?	
5.	Environmental Impact	0		2		2	
6.	Input from/to Other Tasks (enumerate):	10,12,30		10,12,30		10,12,30	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	--		--		--	

Table F-10 (continued)

Water Management Summary for Tasks 11/13 (Alternative 2): Treated Sewage/Process Wastewater Recycle and Reuse Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
8	1,2,3,6	D	**STP Alternate**
15	1-7	A	
18	4	D	
19	6	C	
19	6	D	

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-11

Water Management Summary Task 12:
Reverse Osmosis and Mechanical Evaporation Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Action**		**Action**		**Action**	
2.	Technical vs. Polit./Regulatory	**Regulatory**		**Regulatory**		**Regulatory**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	0	100	0	100
	3.2 Total Wastewater	--		--		--	
	3.3 Point-source discharges	--		--		--	
	3.4 Sources to groundwater	--		--		--	
	3.5 Surface runoff	--		--		--	
	3.6 Domestic waste	--		--		--	
	3.7 Misc. losses	--		--		--	
4.	Financial Impact	0		?		?	
5.	Environmental Impact	0		2		2	
6.	Input from/to Other Tasks (enumerate):	11,13, 30		same		same	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	--		--		--	

Table F-11 (continued)

Water Management Summary Task 12:
Reverse Osmosis and Mechanical Evaporation Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-12

Water Management Summary Task 14: Surface-Water and Ground-Water Rights Study

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Data**		**Data**		**Data**	
2. Technical vs. Polit./Regulatory	**Regulatory**		**Regulatory**		**Regulatory**	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	0	100	0	100	0	100
3.2 Total Wastewater	--		--		--	
3.3 Point-source discharges	--		--		--	
3.4 Sources to groundwater	--		--		--	
3.5 Surface runoff	--		--		--	
3.6 Domestic waste	--		--		--	
3.7 Misc. losses	--		--		--	
4. Financial Impact	0		?		?	
5. Environmental Impact	0		2		2	
6. Input from/to Other Tasks (enumerate):	11,13, 30		**same**		**same**	
7. Input from WR Plan	--		--		--	
8. Input from Monitoring	--		--		--	

Table F-12 (continued)

Water Management Summary Task 14: Surface-Water and Ground-Water Rights Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-13

Water Management Summary Task 15: Surface-Water Evaporation Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Action**		**Action**		**Action**	
2.	Technical vs. Polit./Regulatory	**Technical**		**Technical**		**Technical**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	0	100	0	100
	3.2 Total Wastewater	--		--		--	
	3.3 Point-source discharges	--		--		--	
	3.4 Sources to groundwater	--		--		--	
	3.5 Surface runoff	--		--		--	
	3.6 Domestic waste	--		--		--	
	3.7 Misc. losses	--		--		--	
4.	Financial Impact	0		?		?	
5.	Environmental Impact	0		2		2	
6.	Input from/to Other Tasks (enumerate):	**11,13, 30**		**same**		**same**	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	--		--		--	

Table F-13 (continued)

Water Management Summary Task 15: Surface-Water Evaporation Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
11/13	1	A	
12	1	A	
13	1	A	
21	1	A	

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-14

Water Management Summary Task 16: Water-Yield and Water Quality Study of Other Sources Tributary to Standley Lake and Great Western Reservoir

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Data**		--		--	
2. Technical vs. Polit./Regulatory	**Technical**		--		--	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	0	100				
3.2 Total Wastewater	--					
3.3 Point-source discharges	--					
3.4 Sources to groundwater	--					
3.5 Surface runoff	--					
3.6 Domestic waste	--					
3.7 Misc. losses	--					
4. Financial Impact	0					
5. Environmental Impact	0					
6. Input from/to Other Tasks (enumerate):	**4,30**					
7. Input from WR Plan	--					
8. Input from Monitoring	**USGS**					

Table F-14 (continued)

Water Management Summary Task 16: Water-Yield and Water Quality Study of Other Sources Tributary to Standley Lake and Great Western Reservoir

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-15

Water Management Summary Task 17: Alternatives to Zero Discharge Study

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Data**		--		--	
2. Technical vs. Polit./Regulatory	**Regulatory**		--		--	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	**0**	**100**				
3.2 Total Wastewater	--					
3.3 Point-source discharges	--					
3.4 Sources to groundwater	--					
3.5 Surface runoff	--					
3.6 Domestic waste	--					
3.7 Misc. losses	--					
4. Financial Impact	0					
5. Environmental Impact	0					
6. Input from/to Other Tasks (enumerate):	**4,30**					
7. Input from WR Plan	--					
8. Input from Monitoring	**USGS**					

Table F-15 (continued)

Water Management Summary Task 17: Alternatives to Zero Discharge Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-16

Water Management Summary Task 18: Drain Study

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Data**		--		--	
2. Technical vs. Polit./Regulatory	**Technical**		--		--	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	0	100				
3.2 Total Wastewater	--					
3.3 Point-source discharges	--					
3.4 Sources to groundwater	--					
3.5 Surface runoff	--					
3.6 Domestic waste	--					
3.7 Misc. losses	--					
4. Financial Impact	0					
5. Environmental Impact	0					
6. Input from/to Other Tasks (enumerate):	**4,30**					
7. Input from WR Plan	--					
8. Input from Monitoring	**USGS**					

Table F-16 (continued)

Water Management Summary Task 18: Drain Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-17

Water Management Summary for Task 19 (Alternative 0): Process Waste Minimization Study

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Action**		**Action**		**Action**	
2. Technical vs. Polit./Regulatory	**Regulatory**		**Regulatory**		**Regulatory**	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	0	100	-7.9	75	0	100
3.2 Total Wastewater	--		--		--	
3.3 Point-source discharges	--		--		--	
3.4 Sources to groundwater	--		--		--	
3.5 Surface runoff	--		--		--	
3.6 Domestic waste	--		-7.9	75	--	
3.7 Misc. losses	--		--		--	
4. Financial Impact	0		?		?	
5. Environmental Impact	1		1		1	
6. Input from/to Other Tasks (enumerate):	30		**same**		**same**	
7. Input from WR Plan	--		--		--	
8. Input from Monitoring	--		--		--	

Table F-17 (continued)

Water Management Summary for Task 19 (Alternative 0): Process Waste Minimization Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-17 (continued)

Water Management Summary for Task 19 (Alternative 1): Process Waste Minimization Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Action**		**Action**		**Action**	
2.	Technical vs. Polit./Regulatory	**Regulatory**		**Regulatory**		**Regulatory**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	2.3	75	0	100
	3.2 Total Wastewater	--		--		--	
	3.3 Point-source discharges	--		--		--	
	3.4 Sources to groundwater	--		--		--	
	3.5 Surface runoff	--		--		--	
	3.6 Domestic waste	--		2.3	75	--	
	3.7 Misc. losses	--		--		--	
4.	Financial Impact	0		?		?	
5.	Environmental Impact	1		1		1	
6.	Input from/to Other Tasks (enumerate):	30		same		same	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	--		--		--	

Table F-17 (continued)

Water Management Summary for Task 19 (Alternative 1): Process Waste Minimization Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-17 (continued)

Water Management Summary for Task 19 (Alternative 2): Process Waste Minimization Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Action**		**Action**		**Action**	
2.	Technical vs. Polit./Regulatory	**Regulatory**		**Regulatory**		**Regulatory**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	-10.2	75	0	100
	3.2 Total Wastewater	--		--		--	
	3.3 Point-source discharges	--		--		--	
	3.4 Sources to groundwater	--		--		--	
	3.5 Surface runoff	--		--		--	
	3.6 Domestic waste	--		-10.2	75	--	
	3.7 Misc. losses	--		--		--	
4.	Financial Impact	0		?		?	
5.	Environmental Impact	1		1		1	
6.	Input from/to Other Tasks (enumerate):	30		same		same	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	--		--		--	

Table F-17 (continued)

Water Management Summary for Task 19 (Alternative 2): Process Waste Minimization Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-18

Water Management Summary for Task 20: Domestic and Process Water Pipeline Leak Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Data**		**Data**		**Data**	
2.	Technical vs. Polit./Regulatory	**Technical**		**Technical**		**Technicalry**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	**0**	**100**	**0**	**100**	**0**	**100**
	3.2 Total Wastewater	--		--		--	
	3.3 Point-source discharges	--		--		--	
	3.4 Sources to groundwater	--		--		--	
	3.5 Surface runoff	--		--		--	
	3.6 Domestic waste	--		--		--	
	3.7 Misc. losses	--		--		--	
4.	Financial Impact	0		?		?	
5.	Environmental Impact	1		1		1	
6.	Input from/to Other Tasks (enumerate):	30		**same**		**same**	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	--		--		--	

Table F-19

Water Management Summary for Task 20: Domestic and Process Water Pipeline Leak Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-20

Water Management Summary Task 21 (Alternative 0): Temporary Water Storage Capabilities Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Action**		**Action**		**Action**	
2.	Technical vs. Polit./Regulatory	**Regulatory**		**Technical**		**Technical**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	-121.5	50	?	
	3.2 Total Wastewater	--		-44.1	50		
	3.3 Point-source discharges	--		--			
	3.4 Sources to groundwater	--		-3.3	50		
	3.5 Surface runoff	--		-40.8	50		
	3.6 Domestic waste	--		-77.4	50		
	3.7 Misc. losses	--		0			
4.	Financial Impact	0		12.8 M		?	
5.	Environmental Impact	0		6		6	
6.	Input from/to Other Tasks (enumerate):	Input from: 6,9,10, 11/13,16		Output to: 5,14,15,17 23,24,26, 27,28,30		10,12,30	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	--		--		--	

Table F-20 (continued)

Water Management Summary Task 21 (Alternative 0): Temporary Water Storage Capabilities Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
11/13	6	A	
8	4	A	
26	4	A	
15	1	A	

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-20 (continued)

Water Management Summary Task 21 (Alternative 1): Temporary Water Storage Capabilities Study

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Action**		**Action**		**Action**	
2. Technical vs. Polit./Regulatory	**Regulatory**		**Technical**		**Technical**	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	0	100	-126.3	50	?	
3.2 Total Wastewater	--		-80.7	50		
3.3 Point-source discharges	--		--			
3.4 Sources to groundwater	--		-3.3	50		
3.5 Surface runoff	--		-45.6	50		
3.6 Domestic waste	--		-77.4	50		
3.7 Misc. losses	--		0			
4. Financial Impact	0		91.1 M		?	
5. Environmental Impact	0		6		6	
6. Input from/to Other Tasks (enumerate):	Input from: 6,9,10, 11/13,16		Output to: 5,14,15,17 23,24,26, 27,28,30		10,12,30	
7. Input from WR Plan	--		--		--	
8. Input from Monitoring	--		--		--	

Table F-20 (continued)

Water Management Summary Task 21 (Alternative 1): Temporary Water Storage Capabilities Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
11/13	6	A	
8	4	A	
26	4	A	
15	1	A	

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-20 (continued)

Water Management Summary Task 21 (Alternative 2): Temporary Water Storage Capabilities Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Action**		**Action**		**Action**	
2.	Technical vs. Polit./Regulatory	**Regulatory**		**Technical**		**Technical**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	-121.5	50	?	
	3.2 Total Wastewater	--		-44.1	50		
	3.3 Point-source discharges	--		--			
	3.4 Sources to groundwater	--		-3.3	50		
	3.5 Surface runoff	--		-40.8	50		
	3.6 Domestic waste	--		-77.4	50		
	3.7 Misc. losses	--		0			
4.	Financial Impact	0		16.3 M		?	
5.	Environmental Impact	0		6		6	
6.	Input from/to Other Tasks (enumerate):	Input from: 6,9,10, 11/13,16		Output to: 5,14,15,17 23,24,26, 27,28,30		10,12,30	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	--		--		--	

Table F-20 (continued)

Water Management Summary Task 21 (Alternative 2): Temporary Water Storage Capabilities Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
11/13	6	A	
8	4	A	
26	4	A	
15	1	A	

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-21

Water Management Summary for Task 22: Ground-Water Recharge Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Data**		**Data**		**Data**	
2.	Technical vs. Polit./Regulatory	**Regulatory**		**Regulatory**		**Regulatory**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	0	100	0	100
	3.2 Total Wastewater	--		--		--	
	3.3 Point-source discharges	--		--		--	
	3.4 Sources to groundwater	--		--		--	
	3.5 Surface runoff	--		--		--	
	3.6 Domestic waste	--		--		--	
	3.7 Misc. losses	--		--		--	
4.	Financial Impact	0		?		?	
5.	Environmental Impact	1		1		1	
6.	Input from/to Other Tasks (enumerate):	30		**same**		**same**	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	--		--		--	

Table F-21 (continued)

Water Management Summary for Task 22: Ground-Water Recharge Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-22

Water Management Summary for Task 24: Bypass Upstream Flows Around Rocky Flats Plant Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Data**		**Data**		**Data**	
2.	Technical vs. Polit./Regulatory	**Regulatory**		**Regulatory**		**Regulatory**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	0	100	0	100
	3.2 Total Wastewater	--		--		--	
	3.3 Point-source discharges	--		--		--	
	3.4 Sources to groundwater	--		--		--	
	3.5 Surface runoff	--		--		--	
	3.6 Domestic waste	--		--		--	
	3.7 Misc. losses	--		--		--	
4.	Financial Impact	0		?		?	
5.	Environmental Impact	1		1		1	
6.	Input from/to Other Tasks (enumerate):	30		**same**		**same**	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	--		--		--	

Table F-22 (continued)

Water Management Summary for Task 24: Bypass Upstream Flows Around Rocky Flats Plant Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-23

Water Management Summary for Task 25: Study of Downstream Erosion Potential

Dimension	Time Element					
	Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1. Data vs. Action	**Data**		**Data**		**Data**	
2. Technical vs. Polit./Regulatory	**Regulatory**		**Regulatory**		**Regulatory**	
3. System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
3.1 All Water	**0**	**100**	**0**	**100**	**0**	**100**
3.2 Total Wastewater	--		--		--	
3.3 Point-source discharges	--		--		--	
3.4 Sources to groundwater	--		--		--	
3.5 Surface runoff	--		--		--	
3.6 Domestic waste	--		--		--	
3.7 Misc. losses	--		--		--	
4. Financial Impact	0		?		?	
5. Environmental Impact	1		1		1	
6. Input from/to Other Tasks (enumerate):	30		**same**		**same**	
7. Input from WR Plan	--		--		--	
8. Input from Monitoring	--		--		--	

Table F-23 (continued)

Water Management Summary for Task 25: Study of Downstream Erosion Potential

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-24

Water Management Summary for Task 26: Feasibility of Ground-Water Cutoff/Diversion Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Action**		**Action**		**Action**	
2.	Technical vs. Polit./Regulatory	**Regulatory**		**Regulatory**		**Regulatory**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	0	100	0	100
	3.2 Total Wastewater	--		--		--	
	3.3 Point-source discharges	--		--		--	
	3.4 Sources to groundwater	--		--		--	
	3.5 Surface runoff	--		--		--	
	3.6 Domestic waste	--		--		--	
	3.7 Misc. losses	--		--		--	
4.	Financial Impact	0		?		?	
5.	Environmental Impact	1		1		1	
6.	Input from/to Other Tasks (enumerate):	30		**same**		**same**	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	--		--		--	

Table F-24 (continued)

Water Management Summary for Task 26: Feasibility of Ground-Water Cutoff/Diversion Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-25

Water Management Summary for Task 27: Waste Generation Treatment Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Data**		**Data**		**Data**	
2.	Technical vs. Polit./Regulatory	**Regulatory**		**Regulatory**		**Regulatory**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	0	100	0	100
	3.2 Total Wastewater	--		--		--	
	3.3 Point-source discharges	--		--		--	
	3.4 Sources to groundwater	--		--		--	
	3.5 Surface runoff	--		--		--	
	3.6 Domestic waste	--		--		--	
	3.7 Misc. losses	--		--		--	
4.	Financial Impact	0		?		?	
5.	Environmental Impact	1		1		1	
6.	Input from/to Other Tasks (enumerate):	30		same		same	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	--		--		--	

Table F-25 (continued)

Water Management Summary for Task 27: Waste Generation Treatment Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-26

Water Management Summary for Task 28: Augmentation Plan for the Rocky Flats Plant

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Data**		**Data**		**Data**	
2.	Technical vs. Polit./Regulatory	**Regulatory**		**Regulatory**		**Regulatory**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	0	100	0	100
	3.2 Total Wastewater	--		--		--	
	3.3 Point-source discharges	--		--		--	
	3.4 Sources to groundwater	--		--		--	
	3.5 Surface runoff	--		--		--	
	3.6 Domestic waste	--		--		--	
	3.7 Misc. losses	--		--		--	
4.	Financial Impact	0		?		?	
5.	Environmental Impact	1		1		1	
6.	Input from/to Other Tasks (enumerate):	30		**same**		**same**	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	--		--		--	

Table F-26 (continued)

Water Management Summary for Task 28: Augmentation Plan for the Rocky Flats Plant

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)

Table F-27

Water Management Summary for Task 29: Non-Tributary Ground-Water Study

Dimension		Time Element					
		Immediate FY 91		Short-term (5 years)		Long-term (beyond)	
1.	Data vs. Action	**Data**		**Data**		**Data**	
2.	Technical vs. Polit./Regulatory	**Regulatory**		**Regulatory**		**Regulatory**	
3.	System Impact (Change in MGY going offsite; plus confidence factor)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)	Delta MGY	Conf fact (%)
	3.1 All Water	0	100	0	100	0	100
	3.2 Total Wastewater	--		--		--	
	3.3 Point-source discharges	--		--		--	
	3.4 Sources to groundwater	--		--		--	
	3.5 Surface runoff	--		--		--	
	3.6 Domestic waste	--		--		--	
	3.7 Misc. losses	--		--		--	
4.	Financial Impact	0		?		?	
5.	Environmental Impact	1		1		1	
6.	Input from/to Other Tasks (enumerate):	30		**same**		**same**	
7.	Input from WR Plan	--		--		--	
8.	Input from Monitoring	--		--		--	

Table F-27 (continued)

Water Management Summary for Task 29: Non-Tributary Ground-Water Study

Reporting Dimensions Supplement
Task Interrelationships

Task Providing Input	System Affected	Relationship	Remarks
None			

Codes:

System Affected:

1. All Water
2. Total Wastewater
3. Point-source Discharges
4. Groundwater
5. Surface Runoff
6. Domestic Waste
7. Miscellaneous Losses

Relationship:

A. MGY Reduction in Input Task Precludes Further Reduction in Present Task
B. Reductions are additive
C. Increase in Input Task Allows Reduction in Present Task
D. Reduction in Input Task Causes Increase in Present Task
E. Other (Explain in Remarks)